IN THE UNITED STATES DISTRICT COURT FOR THE

EASTERN DISTRICT OF VIRGINIA

United States of America	)	
v.	)	
David Alcorn et al.,	)	**Criminal Case No. 2:19-CR-47**
Defendants.	)	
	)	

EXPERT REPORT

OF

Coleman Bazelon, Ph.D

November 1, 2021

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I. QUALIFICATIONS

1. I am a Principal in the Washington, D.C. office of The Brattle Group. I am an expert in regulation, strategy and valuation in the wireless, wireline, and video sectors. My practice encompasses the modern information infrastructure and the content that fills it. I have consulted and testified on behalf of clients in numerous telecommunications matters, including wireless license auctions and spectrum management; internet matters, including the broadband and applications markets; media matters, including in the programming and copyright markets; entertainment, including analyses of gaming markets; and sports, advising on economic matters related to baseball, Australian Rules Football, and the Olympics. In addition to regulatory, policy and valuation analyses my engagements have also focused on a range of issues within the competition and intellectual property areas.

2. I frequently advise regulatory and legislative bodies, including the U.S. Federal Communications Commission and the U.S. Congress.

3. Throughout my career, I have had extensive experience with spectrum license auctions. I advise on and evaluate numerous auction designs and regularly serves as an auction advisor for bidders in spectrum license auctions.

4. Prior to joining Brattle, I was a Vice President with Analysis Group, an economic and strategy consulting firm. During that time, I expanded the firm's telecommunications practice area. I also served as a Principal Analyst in the Microeconomic and Financial Studies Division of the Congressional Budget Office ("CBO") where I researched reforms of radio spectrum management; estimated the budgetary and private sector impacts of spectrum-related legislative proposals; and advised on auction design and privatization issues for all research at the CBO.

II. FCC SPECTRUM LICENSE BACKGROUND

A. BACKGROUND ON SPECTRUM AND WIRELESS COMMUNICATIONS

5. The entire breadth of the electromagnetic field is referred to as the electromagnetic spectrum.[1] Figure 1 represents the electromagnetic spectrum. Radio spectrum—or simply 'spectrum'—is a subset of the electromagnetic spectrum that, in addition to radio waves, also includes other phenomena such as visible light and x-rays.[2] Waves in this portion of the electromagnetic spectrum, from 3 kHz to 300 GHz, are called radio waves.

6. Radio spectrum is used to communicate information without having to have a physical connection between two points. The most common two-way (or duplex) wireless communications include calls, mobile broadband and Internet of Things.[3] One-way (or simplex) uses include broadcasting of radio, television and keyboard to computer connections.[4] Other communication uses include private wireless uses such as trucking dispatch or communications around a construction site or railway yard and ham radio.[5] All of these uses share the fixed set of radio waves.

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1 "Anatomy of an Electromagnetic Wave," NASA, https://science.nasa.gov/ems/02_anatomy.

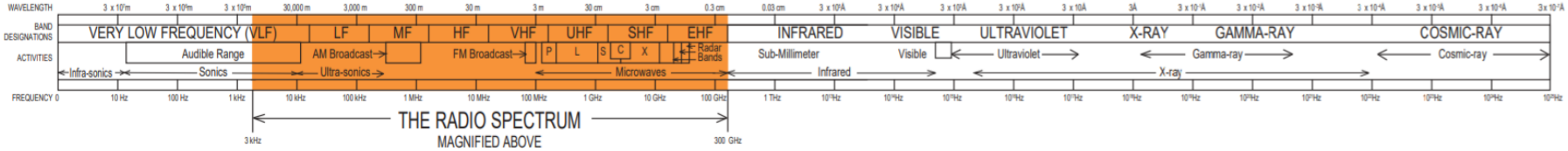
2 Specific portions of the electromagnetic spectrum are defined by their frequency. Frequency, in turn, refers to the number of times the peak of an electromagnetic wave passes a fixed point in a second, which is called a Hertz (Hz). So the radio spectrum is the portion of the electromagnetic spectrum whose frequency is between 3 kHz (3 thousand Hertz) and 300 GHz (300 billion Hertz). See, "What is Spectrum? A Brief Explainer," CTIA, June 5, 2018, https://www.ctia.org/news/what-is-spectrum-a-brief-explainer; "The Electromagnetic Spectrum," NASA, March 2013, https://imagine.gsfc.nasa.gov/science/toolbox/emspectrum1.html#:~:text=Radio%20waves%2C%20gamma%2Drays%2C,at%20the%20speed%20of%20light.

3 "Full Duplex," Voicent, https://www.voicent.com/glossary/full-duplex.php.

4 "Simplex transmission," Computer Hope, https://www.computerhope.com/jargon/s/simptran.htm#:~:text=Examples%20of%20simplex%20include%20radio,one%20direction%2C%20at%20one%20time.

5 "Industrial/Business" FCC, https://www.fcc.gov/wireless/bureau-divisions/mobility-division/industrial-business.

Figure 1: Electromagnetic and Radio Spectrum



Source: "United States Frequency Allocations," NTIA, October 2003, https://www.ntia.doc.gov/files/ntia/publications/2003-allochrt.pdf.

7. The map of radio frequencies has many different bands of spectrum that have been allocated for mobile phone service. When referring to a spectrum band on the map of radio frequencies, its location is identified by the frequencies covered by that band.[6] For example, the Cellular band, is in the 800 MHz band. See Exhibit 1 for the U.S. frequency allocation and the services that are located in the various bands.

8. Broadly speaking, lower-band frequencies travel further and penetrate buildings more easily, making them ideal for network coverage.[7] High-band frequencies, such as millimeter waves, are characterized by very high bandwidths (i.e. lager capacity), but very short propagation, making them more suited for denser, urban environments.[8] Mid-band spectrum offer a combination of coverage and capacity. In the past, most network operators have used a mix of low and mid band frequencies around 2 GHz.[9] 5G and the use of millimeter wave spectrum upends many assumptions about the wireless industry by deploying new network architecture that rests on seamlessly integrating spectrum from different bands, as appropriate, depending on frequency advantages, network characteristics, demand profiles, and other relevant factors.[10]

9. Most spectrum is allocated for exclusive use whereby only one user can use the specified frequencies.[11] The advantage of granting exclusive rights to individual slices of spectrum is that the user can communicate without interference from other

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6 "Introducing Radio Spectrum," GSMA, February 2017, pp. 13-14, https://www.gsma.com/spectrum/wp-content/uploads/2017/04/Introducing-Radio-Spectrum.pdf. ("Introducing Radio Spectrum").

7 Introducing Radio Spectrum, pp. 15-16.

8 Introducing Radio Spectrum, pp. 15-16.

9 Introducing Radio Spectrum, pp. 15-16.

10 "5G Spectrum," GSMA Public Policy Position, March 2020, p. 5, https://www.gsma.com/spectrum/wp-content/uploads/2020/03/5G-Spectrum-Positions.pdf.

11 National Academies of Sciences, Engineering, and Medicine. *A Strategy for Active Remote Sensing Amid Increased Demand for Radio Spectrum;* Spectrum Access: Allocation Policies and the Assignment Process, National Academies Press, 2015, pp. 150-151.

users.[12] Licensed spectrum allows the licensee exclusive use of the specific frequencies within a specified geographic area and forms the backbone of mobile broadband networks. Some spectrum is allocated for shared use—such as the frequencies available for Wi-Fi—where any user can use the frequencies, but without any guarantees of interference-free communications.[13]

10. Users of exclusive-use spectrum gain access to the spectrum through a Federal Communications Commission ("FCC")-issued spectrum license.[14] When the FCC grants permission for exclusive use of spectrum it issues a license for specific frequencies covering specific geographic areas.[15] These licenses are for limited terms, but come with a high expectancy of renewal. [16] The FCC also grants permission to use unlicensed spectrum on a non-exclusive basis by certifying the devices that use those frequencies.[17] Licensed spectrum, because it is effectively 'owned' by the licensee, can be very valuable, especially for frequencies that can be used to provide high-value cell phone or mobile broadband service.[18]

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12 National Academies of Sciences, Engineering, and Medicine. *A Strategy for Active Remote Sensing Amid Increased Demand for Radio Spectrum;* Spectrum Access: Allocation Policies and the Assignment Process, National Academies Press, 2015, pp. 150-151.

13 "Use of Shared Spectrum at the National Level," The World Bank, June 10, 2020, https://digitalregulation.org/use-of-shared-spectrum-at-the-national-level/.

14 National Academies of Sciences, Engineering, and Medicine. *A Strategy for Active Remote Sensing Amid Increased Demand for Radio Spectrum.* Spectrum Access: Allocation Policies and the Assignment Process, National Academies Press, 2015, pp. 151-152.

15 "Spectrum Management: Auctions," Every CRS Report, June 29, 2004, https://www.everycrsreport.com/reports/RL31764.html.

16 "Spectrum Management: Auctions," Every CRS Report, June 29, 2004, https://www.everycrsreport.com/reports/RL31764.html.

17 Clifford M. Harrington and Tony Lin, "Unlicensed But Not Unregulated: An Overview of the FCC's Regulations Regarding Part 15 Devices," Pillsbury Advisory, June 2008.

18 Legally, the licensee does not own the spectrum, although the use rights and disposition that come from a spectrum license resemble a property right. Consequently, it is common to refer to a licensee as the "owner" of the frequencies covered by a license.

11. Spectrum is a finite and scarce natural resource.[19] It is an essential input into any number of wireless services, both commercial and governmental. However, spectrum has no inherent or intrinsic value and its value is defined by the use it is put to.[20] While it is a scarce natural resource, not all spectrum is valued the same. One reason for the variation in the value of spectrum is that the FCC can impose restrictions on the use of certain spectrum.[21] Another reason could be the result of technical limitations and incompatibilities with certain commercial technologies.[22]

12. Spectrum licenses are issued by the FCC and include any limitations on use, such as power limits, geography, or other use limitations. The FCC manages and sets all rules for the non-federal use of radio spectrum. The National Telecommunications and Information Administration in the Department of Commerce performs similar functions for federal uses of spectrum.

B. UNDERSTANDING SPECTRUM VALUE[23]

13. As previously stated, radio spectrum licenses are not inherently valuable; rather, their value derives from the expectation of future profits from the wireless services they enable. In fact, the value of a spectrum license is equal to the present value of the expected future profits that can be earned through its deployment.[24] As the expected profitability of a spectrum-based service increases, the value of the spectrum needed

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19 "What is Spectrum? A Brief Explainer," CTIA, June 5, 2018, https://www.ctia.org/news/what-is-spectrum-a-brief-explainer.

20 The spectrum valuation concepts in this section are explained in greater detail in Coleman Bazelon and Giulia McHenry, "Spectrum Value," Telecommunications Policy (2013), volume 37, issue 9: 737- 747.

21 "Exploring the Value and Economic Valuation of Spectrum," ITU, April 2012, p. 11, https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_SpectrumValue.pdf.

22 "Exploring the Value and Economic Valuation of Spectrum," ITU, April 2012, p. 8, https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_SpectrumValue.pdf.

23 Coleman Bazelon and Giulia McHenry, "Spectrum Value," *Telecommunications Policy* (2013), volume 37, issue 9: 737- 747.

24 Coleman Bazelon and Giulia McHenry, "Spectrum Value," *Telecommunications Policy* (2013), volume 37, issue 9: 737- 747, p. 738.

to facilitate those services also increases. Certain factors influence the expected revenue, and therefore profits, of spectrum and spectrum licenses. Below I list some of these factors:[25]

a. *Frequency Location*. The frequency of spectrum can influence its value. Lower frequency spectrum works better for covering large areas, so when coverage is a factor lower frequency spectrum is more valuable.
b. *Bandwidth.* Beyond simply the greater quantity of spectrum, wider bandwidths are more valuable than narrower bandwidths because they allow more efficient technologies to be deployed. A more efficient technology means more capacity on a given band of spectrum.
c. *Geographic Location.* Spectrum licenses that cover larger, urban areas tend to be more valuable than licenses that cover smaller, rural areas. Even after adjusting for population and bandwidth this value disparity persists.
d. *Use Restrictions.* Sometimes spectrum licenses have use restrictions. For example, a license to broadcast television is restricted to that use and the licensee is not free to cease broadcasting and put the spectrum to another use.[26] Restricting how a license can be used often reduces the value of that license.

14. MHz-pop is a unit measure often used to compare values of different bands of spectrum. It is calculated as the number of people in the geographic area of a license times the number of MHz of spectrum covered by the license.

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[25] For an in depth analysis of these factors, see Coleman Bazelon, Paroma Sanyal, Jonathan Lee, Ezra Frankel and Ryan Taylor, "Network Value Drivers in a 5G World," White Paper, The Brattle Group, TPRC 4, Revised February 12, 2021 ("Network Value Drivers in a 5G World") *See also*, "The Technical Basis for Spectrum Rights: Policies to Enhance Market Efficiency," The Brookings Institution, March 3, 2011, https://www.brookings.edu/wp-content/uploads/2016/06/0303_spectrum_rights_matheson_morris.pdf.

[26] The FCC Incentive Auction was designed to facilitate reallocation of television spectrum precisely because licensees are not free to reallocate it on their own.

C. OPPORTUNITY COST AND ALTERNATIVE TECHNOLOGY

15. A final consideration in spectrum value is the economic concept of opportunity cost. Here the value of spectrum is limited by the cost of alternatives to using the spectrum. This alternative, or opportunity cost, could be the cost of using an alternative band of spectrum or of using a non-spectrum alternative.[27] An example of a spectrum-based alternative would be that a taxi company would never pay more for dispatch services than the alternative of using cell phones for communicating with its fleet. An example of a non-spectrum alternative would be the cost of fiber optic service limiting how much a satellite service could charge to transmit data between two fixed points.

D. HISTORY OF FCC LICENSING

16. As noted above, the FCC issues licenses to use radio spectrum on specific frequencies and in specified geographic locations. When issuing individual licenses, the FCC assesses whether or not there is likely to be significant demand for the spectrum. When demand for the licenses exceeds supply (when there are more applications for the spectrum than there is spectrum licenses), the FCC is required to issue the licenses through an auction.[28]

17. The FCC uses auctions because they are more efficient than the prior methods used. From 1927 to 1981, the FCC decided among competing applications through

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[27] "Exploring the Value and Economic Valuation of Spectrum," ITU, April 2012, Section 3.1, https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_SpectrumValue.pdf.

[28] An exemplar of a valuable license is that multiple entities want the license or in the language of economics there is excess demand for the license. Multiple parties wanting a license would create mutually exclusive applications for spectrum licenses. When the FCC expects mutually exclusive applications, they are required to auction the spectrum. According to the FCC, "The [1997 Budget] Act requires the FCC to use auctions to resolve mutually exclusive applications for initial licenses unless certain exemptions apply, including exemptions for public safety radio services, digital television licenses to replace analog licenses, and non-commercial educational and public broadcast stations." "About Auctions," FCC, http://wireless.fcc.gov/auctions/default.htm?job=about_auctions&page=1.

comparative hearings, also known as "beauty contests."[29] These hearings were time consuming and subject to political influence. Comparative hearings were replaced with lotteries, which is how the initial cellular licenses were issued until 1994.[30] Lotteries encouraged a wasted effort and fraudulent activities and were ultimately replaced with auctions.[31] The FCC adopted the first regulations allowing for spectrum auctions on March 8, 1994.[32]

18. When the FCC does not expect significant demand for a new set of licenses, it issues those licenses on a first-come, first-served basis. This is typically done through a Frequency Coordinator, who is responsible for checking for conflicting applications

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[29] "About Auctions," FCC, http://wireless.fcc.gov/auctions/default.htm?job=about_auctions&page=1; Thomas W. Hazlett, "Assigning property rights to radio spectrum users: Why did FCC license auctions take 67 years?," *The Journal of Law and Economics* 41.S2 (1998): 529-576.

[30] From 1981 to 1984, the FCC issued cellular licenses through comparative hearings. The FCC adopted rules in 1984 and 1986 that provided for the remaining cellular licenses to be issued by lotteries. "800 MHz Cellular Service," FCC, https://www.fcc.gov/general/cellular-service.

[31] "Report to Congress on Spectrum Auctions (FCC 97-353)," FCC Wireless Telecommunications Bureau, October 9, 1997, pp. 7-8, https://www.fcc.gov/sites/default/files/wireless/auctions/data/papersAndStudies/fc970353.pdf. The FCC's lottery system enabled anyone with the correct paperwork to apply for a license. At this time, it was possible to sell an FCC license immediately after acquiring it. This meant that it was possible for someone with no intention of operating a system to win a license in the lottery and sell it to an operator who would commercialize it and pay accordingly. Application mills aggressively marketed the possibility of winning a license in an FCC lottery by using infomercials and "boiler room" phone operations. These sales operations overstated the probability of winning a license, as well as the value of the license. The Federal Trade Commission ("FTC") called application mills and the associated fraud "the most prevalent telemarketing investment scams of the 1990s, costing consumers hundreds of millions of dollars." In the early 90s, the North American Securities Administrators Association and the SEC similarly issued warnings about these schemes. *See:* Max Paglin, ed., *The Communications Act: A Legislative History of the Major Amendments 1934-1996* (Maryland: Pike & Fischer, Inc., 1999); "In the Matter of Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems and Implementation of Section 309(j) of the Communications Act - Competitive Bidding," FTC, March 18, 1996, https://www.ftc.gov/sites/default/files/documents/advocacy_documents/comment-federal-communications-commission-matter-paging-licensing-rules/v960007.pdf; and United States Securities and Exchange Commission, 1995 Annual Report, pp. 5-7, https://www.sec.gov/about/annual_report/1995.pdf.

[32] "Report to Congress on Spectrum Auctions (FCC 97-353)," FCC Wireless Telecommunications Bureau, October 9, 1997, p. 9, https://www.fcc.gov/sites/default/files/wireless/auctions/data/papersAndStudies/fc970353.pdf.

and resolving them in the pre-coordination stage before the application is filed at the FCC.[33] The Frequency Coordinator then passes the applications on to the FCC when the licensing window opens. In other words, the FCC does not accept applications in these situations directly. The relevant dates for applying for specific licenses are specified in FCC Public Notices, which also specify the spectrum available and any special considerations for that spectrum.

19. The licenses at issue in this case were issued this way, and there have been two such Public Notices. A Public Notice was issued on November 27, 2012, with a pre-coordination date of December 11, 2012 and a licensing availability date of January 17, 2013.[34] A second Public Notice was issued on December 30, 2014, and it specified two relevant dates: pre-coordination on January 13, 2015 and licensing starting on February 10, 2015. [35] During the so-called pre-coordination phase, the Frequency Coordinator simply determines what spectrum is available, but the application is not, in fact, submitted to the FCC until the license availability date, which can be six to eight weeks after the Public Notice. In other words, as I further explain in Section V.C, there is no legitimate need to prepare applications, or to solicit payments for such applications, before a Public Notice is issued.

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33 "Industrial/Business Licensing," FCC, https://www.fcc.gov/wireless/bureau-divisions/mobility-division/industrial-business/industrial-business-licensing#:~:text=Frequency%20coordinators%20are%20FCC%20certified,a%20showing%20of%20frequency%20coordination.

34 "Public Notice: Public Safety and Homeland Security Bureau and Wireless Telecommunications Bureau Announce the Completion of 800 MHz Band Reconfiguration in Certain NPSPAC Regions," FCC WT Docket 02-55, DA 12-1838, November 27, 2012, http://www.800ta.org/content/fccguidance/DA_12-1838_11.27.12.pdf.

35 "Public Notice: Public Safety and Homeland Security Bureau and Wireless Telecommunications Bureau Announce the Completion of 800 MHz Band Reconfiguration in Certain NPSPAC Regions and the Availability of Additional Sprint Vacated Channels," FCC WT Docket 02-55, DA 14-1904, December 30, 2014, http://www.800ta.org/content/fccguidance/DA_14-1904_12.30.14.pdf.

III. THE LICENSES AT ISSUE: 800 MHZ REBANDING

A. RATIONALE AND THE CREATION OF EXPANSION AND GUARD BANDS

20. Between the mid-1970s and early 2000s, the FCC undertook a series of spectrum relocations in the 800 MHz band due to the changing use of spectrum. By the early 2000s, the 800 MHz band was comprised of two segments—cellular telephone and public safety.[36] The Cellular segment occupied the frequencies from 824 MHz to 849 MHz and 869 MHz to 894 MHz.[37] The Public Safety segment occupied the band of spectrum between 821-824 MHz and 866-869 MHz (exclusively) as well as 809.75-816 MHz and 854.75 to 861 MHz, interleaved with Specialized Mobile Radio ("SMR"), Business, and Industrial Land Transportation channels.[38] Interleaved spectrum refers to a band plan where small allocations alternate between two different services. For example, one sliver of spectrum (a channel) can be allocated to public safety uses, and the adjacent sliver is allocated to a SMR licensee, and then the next sliver to public safety again, and so on. Until the early 1990s, Nextel[39] (then called Fleet Call) operated in the range of 806-817 MHz and 851-866 MHz (within the interleaved band).[40]

21. This spectrum was allocated by the FCC for SMR service. SMR licenses do not allow for the benefits of cellular architecture systems—namely, multiple connected cell sites that facilitate frequency reuse and greatly increase the capacity of any given

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36 FCC, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order (FCC 04-168), WT Docket 02-55, adopted July 8, 2004, p. 15, https://www.fcc.gov/release-fcc-04-168 ("Fifth Report and Order").

37 Fifth Report and Order, p. 15.

38 Fifth Report and Order, p. 15. Specialized Mobile Radio, or SMR, refers to a two way radio, or walkie-talkie.

39 Nextel Communications was founded in 1987 and was originally called FleetCall. The company changed its name in 1993, and later merged with Sprint Corporation in 2005. "The Nextel Brand History," Nextel, https://www.nextelmobileworldwide.com/nextel-history/.

40 Fifth Report and Order, p. 16.

spectrum band.[41] Due to these restrictions, Nextel petitioned the FCC to be able to operate an enhanced SMR ("ESMR") system that would incorporate elements of cellular architecture. In 1991, the FCC granted the request.[42]

22. As noted above, Nextel's spectrum was interleaved with Public Safety channels. The interleaved nature of this spectrum caused reliability issues for critical communications once Nextel began operating its ESMR system. As the FCC explained, this interference caused "communication 'dead zones'" for public safety systems.[43] The reason for the interference was that ESMR devices are high-power devices when compared to the Public Safety radios.[44] The relative high power of the ESMR devices caused Public Safety radios to frequently lose contact with their base stations. The problem was not that both systems were operating simultaneously, but rather that they did not have adequate separation between them—either along the electromagnetic spectrum or geographically. Figure 2provides a clear visual representation of interleaved spectrum.

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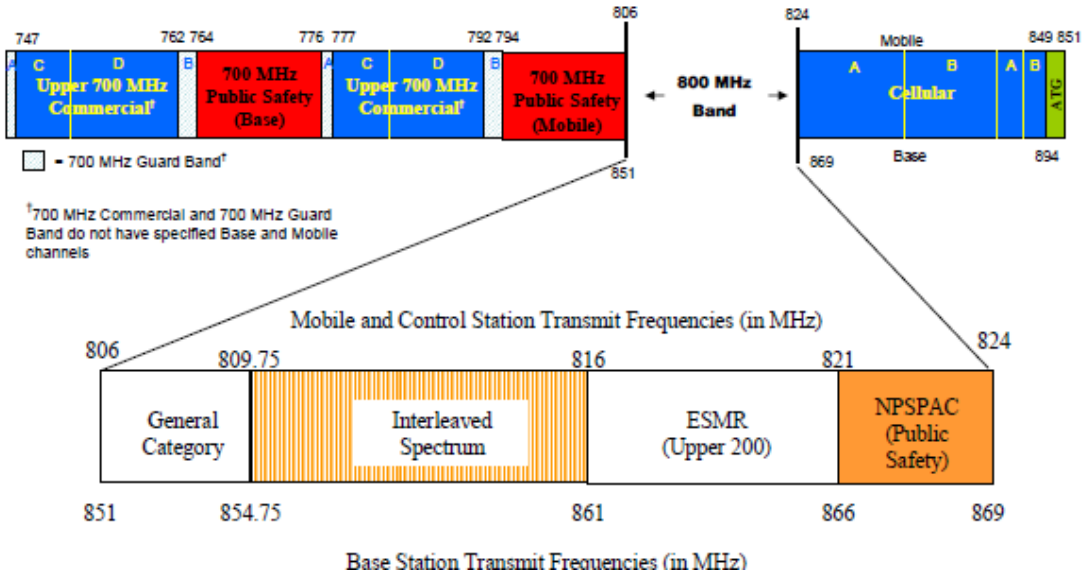
41 The magic of cellular architecture is its ability to increase capacity by reusing the same frequencies at different locations. Cellular licenses cover large geographic areas, not specific transmitter locations. By reducing the power of a transmitter on a cell tower, additional cell towers can be built to fill in the gaps. Each of those additional cells in the network can reuse the licensed frequencies.

42 *United States v. Motorola, Inc. and Nextel Communications, Inc.*, Public Comments and Response on Proposed Final Judgment, Federal Register Volume 60, April 17, 1995, https://www.gpo.gov/fdsys/pkg/FR-1995-04-17/html/95-8814.htm.

43 "800 MHz Band Reconfiguration Handbook" 800 MHz Transition Administrator, LLC, September 6, 2013, p. 8, http://www.800ta.org/content/resources/Reconfiguration_Handbook.pdf.

44 Public safety systems are referred to as "high site" systems because the base stations are usually located on tall buildings or hill tops. These systems have power output in the range of 100 to 200 watts and have a wide coverage area. In contrast, ESMR systems are "low-site" systems, which mean that there are many base stations on either 30- to 50-foot poles or one- to two-story buildings. ESMR systems transmit continuously at up to 1,000 watts.

Figure 2: 800 MHz Spectrum Allocation (Pre-rebanding)[45]



23. In 2004, the FCC announced that it would begin consolidating Public Safety channels and channels used for other uses in the 800 MHz band.[46] The FCC wrote, "we are guided by the principle that we can minimize unacceptable interference in the 800 MHz band by placing similar system architectures in like spectrum and isolating dissimilar architectures from one another."[47] In addition to minimizing the number of borders between different users, continuous blocks of spectrum have the advantage of being able to use larger bandwidths and are more efficient for digital technologies.[48]

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45 Fifth Report and Order, p. 15.

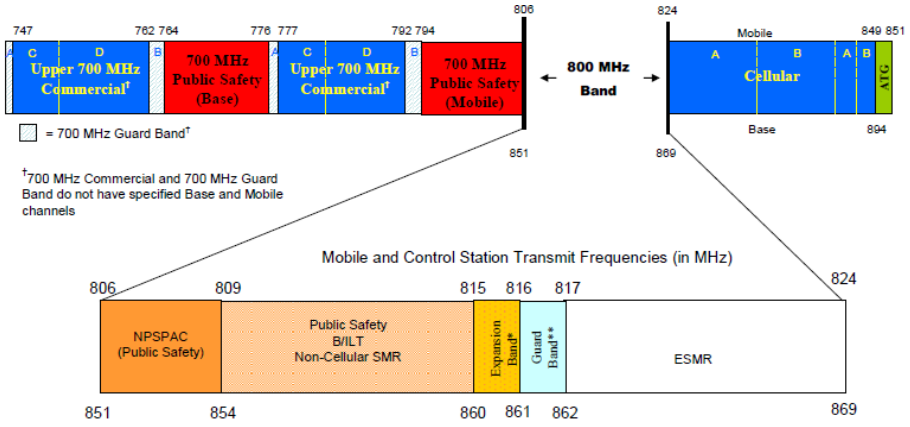
46 Fifth Report and Order, p. 15.

47 Fifth Report and Order, p. 15.

48 Spectrum is used to transmit signals, and these signals can be either analog or digital. Analog signals take the form of continuous, rounded waves, while digital signals are a series of zeroes and ones (binary data, graphically represented as a square wave). For technical reasons, digital signals require more bandwidth for transmission, though they have a much higher signal-to-noise ratio and are less prone to errors in the transmissions. According to Gilbert Held, who was written more than 40 books on telecommunications, networking, and computing, "the advantages gained by sending the signals as binary data, however, more than offset the requirement for greater bandwidth." Gilbert Held, "Data Communications: Use the Right Medium for your Message," April 12, 2002, http://www.informit.com/articles/article.aspx?p=26321&seqNum=6.

24. In February 2005, as expected, Nextel approved of the FCC's reconfiguration plan - this plan is commonly referred to as "the 800 MHz rebanding" plan – that they would play a major role in.[49] As public safety, critical infrastructure industries, and other non-cellular systems share similar system architecture, they were assigned to an 18 MHz band located at 806-815 MHz/851-860 MHz, and a 14 MHz band located at 817-824 MHz/862-869 MHz was designated for ESMR.[50] See Figure below for an illustration of the rebanded spectrum (compared to above).

Figure 3: 800 MHz Allocation (Post-rebanding)[51]



25. To further minimize any potential interference problems, the FCC created a Guard Band and an Expansion Band.[52] These bands create a buffer between the public safety licensees and the ESMR portion of the band. In other words, these bands create a buffer zone between two types of system architecture that have had interference problems in the past: cellular architecture (ESMR) and non-cellular architecture (public safety systems and high-site systems, generally).[53] The Expansion Band is

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49 The plan is detailed in Fifth Report and Order, p. 16. Note that, in addition to spectrum reconfiguration, this plan detailed additional technical controls that would be implemented to address interference.

50 Fifth Report and Order, p. 9.

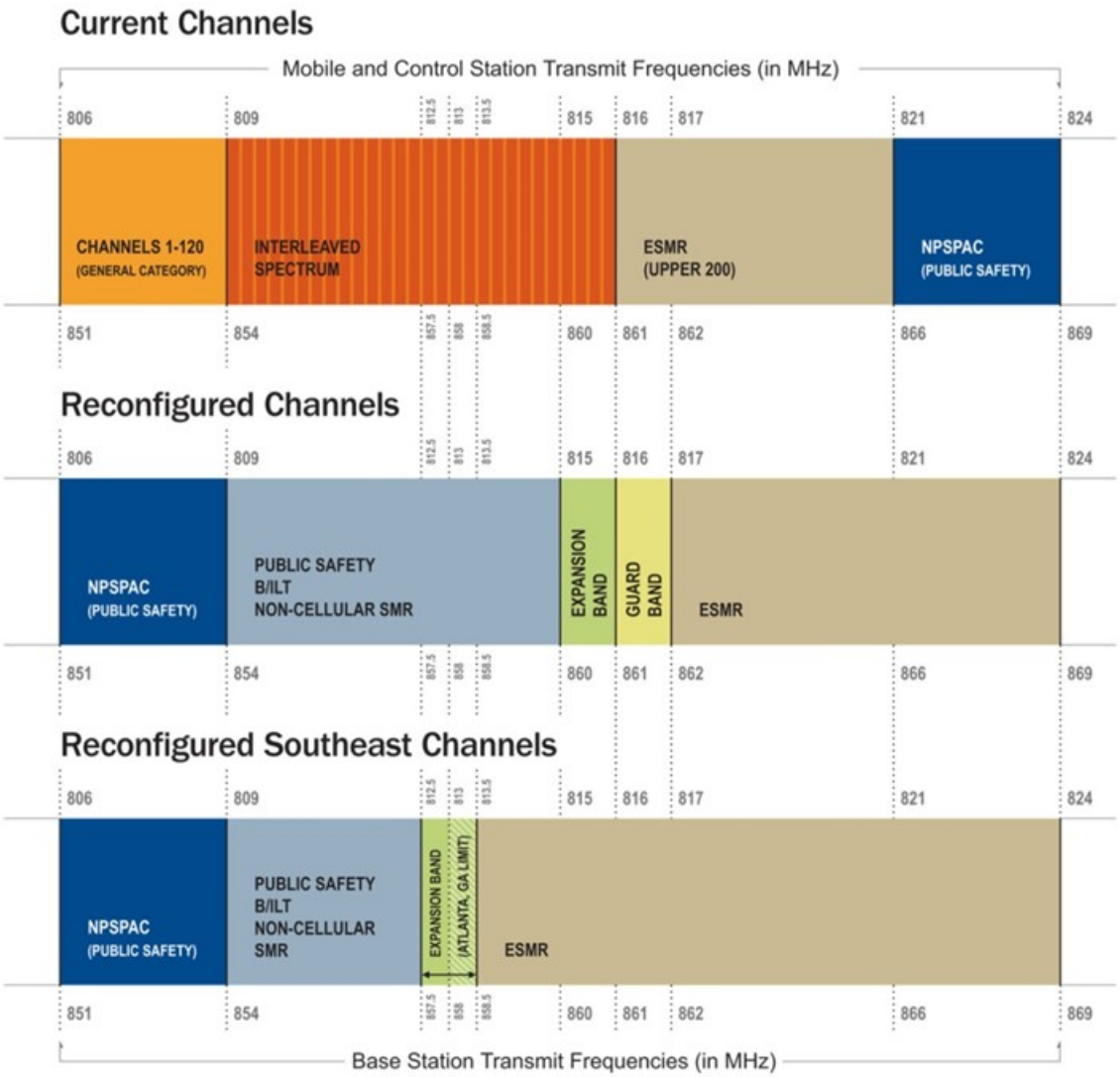
51 Fifth Report and Order, p. 16.

52 Fifth Report and Order, pp. 85-86.

53 "800 MHz Band Reconfiguration Handbook," 800 MHz Transition Administrator, LLC, September 6, 2013, p. 22, http://www.800ta.org/content/resources/Reconfiguration_Handbook.pdf.

located at 815- 816 MHz/860-861 MHz81, and the Guard Band is located at 816-817 MHz/861-862 MHz.[54] **Error! Reference source not found.** illustrates the location (along the electromagnetic spectrum) of the Expansion and Guard Bands. The licenses at issue in this case are all in either the Expansion or Guard Band.

Figure 3: Location of the Expansion and Guard Bands[55]



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54 There is no Guard Band in the Southeastern U.S. "800 MHz Band Reconfiguration Handbook," 800 MHz Transition Administrator, LLC, September 6, 2013, p. 23, http://www.800ta.org/content/resources/Reconfiguration_Handbook.pdf.

55 The top graphic shows the then-current channels prior to rebanding. "800 MHz Band Reconfiguration Program," 800 MHz Transition Administrator, LLC., http://www.800ta.org/_img/figures/img_channel_lrg.gif.

Notes:

The FCC implemented an alternative band plan affecting the Expansion, Guard, and ESMR bands in the Southeastern Region of the U.S. "The 800 MHz Reconfiguration Program," 800 MHz Transition Administrator.

26. When the FCC reconfigured the band, it put several restrictions on the Expansion and Guard Bands. Specifically, in the Fifth Report and Order, the FCC mandated that, "800 MHz cellular systems – as defined in Section 90.7 – are prohibited from operating on channels 1-550 in non-border areas."[56] All of the licenses at issue in this case are for channels ranging from 472 to 549 and are in non-border areas.[57] Section 90.7 defines high-density cellular system in the 800 MHz ranges, and any major wireless carrier like Sprint (now T-Mobile) would be classified as a high-density cellular system.[58] A non-high-density cellular system—that is one limited to six or fewer towers—would not be useful to a large wireless company. Accordingly, major wireless carriers are prohibited from operating their cellular systems in the Guard Band or Expansion Band.

B. FINANCING THE REBANDING AND VALUING THE ASSOCIATED SPECTRUM

27. Changing frequencies is non-trivial, and in most cases requires new equipment and the associated engineering and testing costs. To achieve this, the FCC plan for the 800 MHz band required Nextel "to relinquish all of its 800 MHz band spectrum holdings below 817 MHz/862 MHz."[59] In exchange, Nextel was granted the spectrum rights for 10 MHz of spectrum located at 1910-1915 MHz/1990-1995 MHz. This large block of paired contiguous spectrum was worth more than the interleaved spectrum

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56 Fifth Report and Order, p. 210.

57 Border areas are defined as areas within 140 km from the border of Canada and 110 km from the border of Mexico. Fifth Report and Order, p. 95.

58 Specifically, Section 90.7 of FCC 04-168 defines an 800 MHz cellular system as a high-density system if it has five or more overlapping interactive sites with hand-off capability and is a site with an antenna height of less than 30.4 meters above ground level with an antenna height above average terrain of less than 152.4 meters and twenty or more paired frequencies. Fifth Report and Order, p. 189.

59 Fifth Report and Order, p. 9. Nextel gave up approximately 10.5 MHz in the 800 MHz spectrum (8.5 MHz in the General Category and 2 MHz).

that Nextel relinquished. To prevent Nextel from receiving a windfall from the reconfiguration, Nextel was required to pay for all of the costs associated with shifting the public safety systems and any other 800 MHz band incumbents to a new location in the 800 MHz band.[60] However, the costs were unknown and could have been significant. While Nextel gained spectrum rights in the 1900 MHz band, it relinquished its rights in the 800 MHz band and had to pay all associated reconfiguration costs. If the value of the 1900 MHz band was greater than the transition cost, Nextel would be required to pay that differential amount to the U.S. Treasury to guard against any windfalls.[61]

28. The FCC estimated the value of the 1900 MHz spectrum that was granted to Nextel by analyzing sales of comparable spectrum.[62] The FCC selected two recent transactions as benchmarks. The transactions were both arms-length transactions and involved only spectrum, as opposed to a bundle of spectrum and other assets. Further, the transactions were for relatively large numbers of licenses spanning a diverse geographic mix of large and small markets, which would make the transactions reasonable proxies for a nationwide license. The FCC took the average value of $1.62 per MHz-pop and scaled it up by five percent to account for the fact that Nextel was receiving a nationwide license while the comparable transactions were for less than nationwide licenses, arriving at a final value of $1.70 per MHz-pop. Based on the U.S. population in 2000 of 285.62 million, the FCC estimated the value of the 1900 MHz spectrum to be $4.86 billion.[63]

29. The FCC similarly valued the 800 MHz spectrum given up by Nextel. For the contiguous bands it adopted the $1.70/MHz-pop estimate it used for the 1900 MHz

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60 Fifth Report and Order, p. 9.

61 Nextel also relinquished all of its 700 MHz Guard Band spectrum. The FCC concluded it to have a de minimis value. Fifth Report and Order, p. 153.

62 Fifth Report and Order, pp. 142-143.

63 $4.86 billion is equal to the product of 10 MHz of spectrum, the value of $1.70 per MHz-pop, and the population of 285.62 million.

spectrum. This estimate recognized that when compared to the 1900 MHz band, the smaller bandwidth and different technologies offset any increase in value from the propagation benefits of lower frequencies.[64] For the interleaved bands, the FCC reduced this amount by 12.5% to $1.49/MHz-pop for various inefficiencies created by the interleaved nature of the channels.[65] Crucially, however, this estimate is for an estimated total of 3.76 MHz of spectrum that is used in an integrated, nationwide mobile phone network.[66] It was not for individual channels or spectrum that could not be integrated into a national commercial wireless network. In other words, the FCC's value for this spectrum was based on how it had been used by Nextel prior to rebanding, i.e., as part of a nationwide cellular network.

30. However, the value of spectrum changes depending on FCC rules on how, and for what purpose, the spectrum can be used. For example, the recent 900 MHz rebanding created a 6 megahertz broadband segment in a band that was primarily dedicated to narrowband operations.[67] This change certainly altered the value of the band given that the use cases had changed. Similarly, for the 800 MHz Band, the rebanding had changed the use case for the Guard and Expansion Bands.

31. There were severe limitations placed on the 800 MHz Guard Band and Expansion Band as part of the rebanding process, and this segment of the 800 MHz spectrum band could not be used as it may have been prior to rebanding. Therefore, we cannot use the value of the 800 MHz Band prior to rebanding, to value these Guard and Expansion Band. In fact, given the restrictions placed on the Guard and Expansion Band frequencies the value of these bands would be near zero. Another recent example that corroborates the FCC view of Guard Bands is in the recently concluded

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64 Fifth Report and Order, p. 150.

65 Fifth Report and Order, pp. 151-152.

66 Fifth Report and Order, p. 151.

67 "FCC Transforms 900 MHz Band to Enable Broadband Deployment by Utilities and Other Industries," FCC press release, May 13, 2020, https://docs.fcc.gov/public/attachments/DOC-364320A1.pdf.

C-Band auction in February 2021, where the FCC has designated 20 megahertz of spectrum as a Guard Band to protect against interference, and is not auctioning the 20 megahertz.[68]

32. As per a 2004 FCC order, the FCC said Nextel would pay all costs of rebanding.[69] However, rebanding has taken longer and been more costly than expected. Rebanding is still not complete,[70] and Sprint has spent approximately $3.4 billion from the inception of the program to March 31, 2015.[71]

IV. THE CHARGED CO-CONSPIRATORS' REPRESENTATIONS

A. POTENTIAL USES OF SPECTRUM

33. The charged co-conspirators represented to investors that the spectrum in the 800 MHz Expansion Band and Guard Band was very valuable because it would be possible to sell or lease it back to Sprint or other major wireless carriers.[72] Janus Spectrum, LLC ("Janus Spectrum" or "Janus") represented to potential investors that the spectrum for which it was offering application services was useful to major wireless carriers and, indeed, coveted by them, that it was compatible with their technology, and that its value was comparable to the value of nearby spectrum that

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68 "FCC Establishes Competitive Bidding Procedures for December's C-Band Auction," FCC press release, August 6, 2020, https://docs.fcc.gov/public/attachments/DOC-366000A1.pdf.

69 Nextel has wanted to cap the payments at $850 million. However, the FCC believed this estimate to be too low and required Nextel to "secure its commitment by means of an irrevocable letter of credit in the amount of $2.5 billion." See Fifth Report and Order, pp. 19.

70 The 800 MHz Transition Administrator posts quarterly progress reports online (http://www.800ta.org/content/reporting/). As of March 11, 2021 the most recent report available is Q4 2020 (published on February 22, 2021), and the closing of 800 MHz rebanding is only 99.91% complete.

71 Sprint Corporation, Form 10-K for the Fiscal year ended March 31, 2015, p. 7, https://www.sec.gov/Archives/edgar/data/0000101830/000010183015000012/sprintcorp201410-k.htm. The report notes that all of the costs accounting for $3.4 billion have been deemed eligible costs by the transition administrator.

72 Audio transcription of "Money from Thin Air," Exhibit 21, pp. 34-35. Please note that all exhibit references refer to exhibit numbering from *Securities and Exchange Commission v. Janus Spectrum LLC et al.* Case No. 2:15-CV-00609-SMM.

had recently changed hands.[73] Janus explained to investors that the spectrum at issue was comprised of "clean and contiguous paired channels in the Expansion and Guard Band that can be used by any advanced wireless technology—TDMA, CDMA, FDMA, or LTE."[74]

34. Mr. Maerki repeatedly told investors that the spectrum would be useful to Sprint or other major wireless carriers and that those companies would pay thousands of dollars per month to lease the spectrum. In his presentation, "Money from Thin Air," Mr. Maerki explained that "Sprint, or somebody like them" does not want to lose their capacity and would "probably lease it back [from] you and pay you $4,800 a month."[75] He continues, "Sprint is going to need [the 800 MHz spectrum] … But if they don't take it, AT&T needs it, and so does Verizon. More importantly T-Mobile really needs it. So do the other ones."[76]

35. Mr. Maerki also made similar representations in live speaking engagements. Mr. Alcorn and Mr. Maerki attended an event hosted by Mr. Jones to solicit investors in Premier Spectrum Group. Mr. Maerki told attendees, "We have two of our licenses. We will have more and ultimately we will have all 25. Everybody will have their licenses….If you hire us, we will go talk to Sprint and make a deal. That's what we

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73 Audio transcription of "Money from Thin Air," Exhibit 21, pp. 34-35; Janus Spectrum Group Investment Offering, Exhibit 89, p. 4, August 2012; "Oakdale Capital LLC PPM Comments and Questions," Exhibit 217, February 29, 2012.

74 "PPM FAQ Janus Spectrum LLC," Exhibit 229, p. 4. The acronyms refer to different types of technologies used in wireless systems. TDMA is Time Division Multiple Access, CDMA is Code Division Multiple Access, FDMA is Frequency Division Multiple Access and LTE is Long-Term Evolution. LTE is the current standard used for most 4G or fourth generation wireless broadband networks deployed today.

75 Audio transcription of "Money from Thin Air," Exhibit 21, p. 34; Audio transcription of WPSL Radio Show, Exhibit 23, p. 34.

76 Audio transcription of "Money from Thin Air," Exhibit 21, pp. 34-35.

can guarantee. We can't guarantee anything else."[77] Mr. Alcorn told an investor, "The most likely user will be Sprint but the market is very deep."[78]

36. The charged co-conspirators explained that "68 paired channels will be available to qualified entities by simply filing strategically prepared license applications. Today, this targeted 800 MHz Spectrum is among the most coveted Spectrum to wireless carriers."[79] They claimed 800 MHz spectrum is coveted because the signal travels farther, the signal penetrates buildings better than other higher band spectrum, and it carries more digital information per channel bandwidth.[80]

37. The charged co-conspirators claimed the spectrum available is located close to the spectrum that AT&T and Verizon paid nearly $17 billion for in 2008.[81] They also claimed that AT&T and Verizon are building out their modern LTE networks on these channels.[82]

38. On June 24th 2016, in a meeting organized by the charged co-conspirators, Peter Lewis, who later testified for Daryl Bank at Bank's criminal trial, discussed using the 800 MHz spectrum licensed by the charged co-conspirators for IoT applications and generally discussed the growth of the IoT market.[83] Additionally, in his April 7, 2016, testimony Peter Lewis discusses how IoT could be used to monetize the spectrum and

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77 Audio transcription of cellular presentation with Bobby Jones and Kent Maerki, Exhibit 30, p. 40.

78 Email from David Alcorn to John Dillon, Exhibit 114, p. 3, May 2, 2013.

79 "Oakdale Capital LLC PPM Comments and Questions," Exhibit 217, February 29, 2012.

80 "Oakdale Capital LLC PPM Comments and Questions," Exhibit 217, February 29, 2012.

81 Janus Spectrum Group Investment Offering, Exhibit 89, p. 4, August 2012; "Oakdale Capital LLC PPM Comments and Questions," Exhibit 217, February 29, 2012.

82 Janus Spectrum Group Investment Offering, Exhibit 89, p. 4, August 2012.

83 Janus Workshop on Emerging Technologies for Connectivity & Communications, Washington D.C., June 24, 2014, Exhibit 319, pp. 2-4.

represented that "by the time you get a system installed and start marketing and whatnot, within a matter of months that you would start generating income."[84]

B. SPECTRUM VALUE AND INVESTMENT RETURNS

39. The charged co-conspirators claimed to investors that they could expect very high annual returns—as much as 862% per year.[85] These representations were based on leasing or selling the spectrum to a major wireless carrier. For example, in Janus Spectrum's *pro forma* projections regarding the expected rates of return on licenses in the largest 25 Economic Market Areas, Janus represented an average annual rate of return of 862%, with returns ranging from 324% to 3,373% depending on the geographic market.[86] Underlying these projections were assumptions that Janus Spectrum would apply for, and receive, licenses for five channels in each of the 25 largest Economic Market Areas.[87] These rates of returns were built on a series of assumptions that included assuming the licenses covered Economic Areas (large metropolitan areas that span millions of people and many miles), which was the incorrect comparable given the characteristics of the bands at issue here.[88]

40. Similarly, Mr. Bank, through Dominion Private Client Group, distributed offering documents that represented, "Investors are provided with opportunities to achieve a 100% annual preferred return on invested capital plus 50% of additional profits, derived from anticipated revenues resulting from the acquisition and monetization of valuable FCC licenses, or Spectrum. Alternatively, opportunities may exist for

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84 Peter T. Lewis Testimony Transcript In the Matter of Securities and Exchange Commission v. Janus Spectrum LLC, et al., April 7, 2016, p. 190.

85 Janus Spectrum pro forma, Exhibit 113, p. 1.

86 Janus Spectrum pro forma, Exhibit 113.

87 Janus Spectrum Group Investment Offering, Exhibit 89, p. 5, August 2012.

88 The EA licenses were for the original 800 MHz allocations. See Figure on p. 15. The FCC stated that once vacated by Nextel, any operations in the guard band would be subject to increasing levels of interference, See ¶ 158. Both references cite to Fifth Report and Order.

investors to more quickly capitalize their investment by selling at a multiple of their initial contribution, within the first two years."[89]

41. The Janus website, which was publicly accessible, touted "extraordinary" returns. The website represented, "if only 1 or 2 applications are approved, and we cannot believe that will not happen, the return on investment will be extraordinary."[90] Janus led investors to believe that licenses would start generating income in 12 to 18 months.[91]

42. Other marketing materials represented that, based on anticipated revenues from acquiring and monetizing FCC licenses, investors have opportunities to achieve a 100% annual preferred return on invested capital plus 50% of additional profits.[92] On invitations to a webinar he was hosting, Mr. Jones described the investment as having "double-digit returns projected monthly within the next 24 months."[93] Similarly, Mr. Alcorn emailed potential investors and stated that the offering was a secure, passive long term 60% annual return investment. He also claimed that 800 MHz is the best spectrum because of its penetration ability and coverage.[94]

43. In his "Educational Preview About Airwaves Presentation," Mr. Maerki explained to potential investors, "According to recent analytical models, by owning an 800 megahertz license, one may achieve an annual income up to 300 percent or more while sharing the license with a major wireless carrier."[95] His "Money From Thin Air" presentation represented that the wireless industry has grown by 20% a year for

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89 Janus Spectrum Group Investment Offering, Exhibit 89, p. 4, August 2012.

90 Excerpt from Janus website, Exhibit 228.

91 "PPM FAQ Janus Spectrum LLC," Exhibit 229 at p. 3.

92 "Oakdale Capital LLC PPM Comments and Questions," Exhibit 217, February 29, 2012.

93 Bobby Jones webinar invitation, Exhibit 284, April 15, 2013; Email from Bobby Jones to investors, Exhibit 285, July 23, 2013.

94 Email from David Alcorn to investor, Exhibit 335, p. 1, July 24, 2010.

95 Audio transcription of "Educational Preview About Airwaves," Exhibit 21, p. 6.

three decades and implied such growth and its associated returns would continue for the foreseeable future.[96]

C. REPRESENTATION REGARDING APPLICATION URGENCY

44. The charged co-conspirators expressed to potential investors that it was important to apply for the licenses as quickly as possible because the FCC was going to issue licenses on a first- come, first-served basis. The charged co-conspirators stressed to investors that it was important to apply even before the FCC issued the Public Announcement that would lay out the timetable for the application process.

45. Specifically, in his "Money From Thin Air" presentation, Mr. Maerki stressed to investors that there was limited time to take advantage of the investment opportunity. He stated, "Urgency? Yes. First come, first served. These will be gone in about three to five months."[97] At the end of his "Educational Preview About Airwaves" presentation, Mr. Maerki explained to investors that "over 50 percent of the spectrum available as a result of what I have just described has already been applied for. This is very limited, so please get more information quickly."[98] In the same presentation, he explained, "Starting in 2012, the FCC is expecting to begin issuing public notices for the filing of those licenses, and issuing license grants to the applicants. This will be the first time the public will be notified of the opportunity."[99] He led investors to believe that their best chance to get a license was to work with someone with the ability to apply before the public is even notified and before the FCC would accept applications.

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96 Audio transcription of "Money from Thin Air," Exhibit 21, p. 18.

97 Audio transcription of "Money from Thin Air," Exhibit 21, p. 37.

98 Audio transcription of "Educational Preview About Airwaves," Exhibit 21, p. 12.

99 Audio transcription of "Educational Preview About Airwaves," Exhibit 21, p. 11.

D. $40,000 Fee and Actual Costs

46. The charged co-conspirators led investors to believe that the $40,000 application fee the investors were paying was covering the actual cost for applying for FCC spectrum licenses in the 800 MHz Expansion Band and Guard Band. For example, in Mr. Maerki's, "Money From Thin Air" presentation, he stated, "An application requires quite a lot: a database, engineering, legal work, pre-site selection, precise timely submission, et cetera."[100] Mr. Alcorn also made representations to the effect that the application fee covered actual costs, and that Janus only expected to make money on the back end, through its management and monetization of the licenses.[101]

E. Risk and Passive Nature of Investing in FCC Spectrum Licenses

47. The charged co-conspirators also repeatedly represented to potential investors that the investment opportunity was very low risk. In "Money From Thin Air," Mr. Maerki told investors that the investment opportunity was "very low risk," "very high income," "certainly work free," and "much lower risk than the stock market."[102] Mr. Maerki also proclaimed, "[Ownership of spectrum]'s got very high income, historically. It's got very low risk; hardly, if any. … People that own spectrum make a lot of money and create a lot of wealth."[103] The charged co-conspirators represented to potential investors that no work was required—the investment was passive. Janus Spectrum would manage the licenses for the investors. In "Money from Thin Air," Mr. Maerki stressed that there was no work involved. "So why buy spectrum? It's a work-free business. … And if you hire a manager, infinite return on your expended time."[104]

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100 Audio transcription of "Money from Thin Air," Exhibit 21, p. 11.

101 "Conference Call Transcript," Exhibit 26, March 9, 2013, p. 13.

102 Audio transcription of "Money from Thin Air," Exhibit 21, pp. 35, 38.

103 Audio transcription of "Money from Thin Air," Exhibit 21, p. 18. See also, Audio transcription of WPSL Radio Show, Exhibit 23, p. 20, which notes that "monthly income approaches total investment."

104 Audio transcription of "Money from Thin Air," Exhibit 21, p. 38.

48. Mr. Alcorn stressed that an important message to investors and sales representatives (who would ultimately pass this on to investors) was that Janus Spectrum was the best qualified to manage their licenses.[105] Dominion Private Client Group materials stated, "Our Manager will manage our Company so that the Members will have minimal involvement in the management of spectrum licenses and Company operations."[106]

49. Although Janus Spectrum's services agreements disclosed the requirement that the FCC rules and regulations required the construction of a site within 12 months after the grant of a license, the charged co-conspirators represented to investors that this would be a minimal burden, "[b]ecause they should be able to, again, either lease or piggyback or do leases with towers that already exist."[107]

V. THE CHARGED CO-CONSPIRATORS MISREPRESENTED KEY ASECTS OF THE SPECTRUM VALUE AND NATURE OF INVESTMENT

A. THE CHARGED CO-CONSPIRATORS MISREPRESENTED THE POTENTIAL USES OF THE REBANDED LICENSES

50. The charged co-conspirators represented that the spectrum was valuable because there would be demand from Sprint or the other major wireless carriers. However, there were regulatory and technical reasons why this would not be possible. All of these reasons were spelled out in publicly available documents.

51. The licenses for which the charged co-conspirators were selling license services were very different from the major cell phone companies' licensed spectrum. The charged co-conspirators were selling licenses to 800 MHz Expansion Band and Guard Band, which are the left over slivers of the spectrum that had made the cell phone company's licenses useful. As explained in Section III.A, two different system

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105 Email from David Alcorn to Kent Maerki, Exhibit 219, November 5, 2012.

106 Janus Spectrum Group Investment Offering, Exhibit 89, p. 5, August 2012.

107 Deposition of Daryl Bank, June 11, 2014, pp. 203-204; Deposition of Terry Johnson, April 20, 2016, pp. 135-136. Mr. Johnson explained that the build-out costs would not be incurred because the spectrum would be leased back to Sprint, which already had its own towers.

architectures share the 800 MHz band—high-site (Public Safety) and Cellular. The purpose of the 800 MHz reconfiguration was to eliminate interference between these bands, which was done by separating them and creating buffer space between them. For the buffer to remain effective, it had to have restrictions on it use, one of which is that it cannot use high-density cellular architecture because the cellular transmissions interfere with the high-site public safety transmissions.

52. The charged co-conspirators misrepresented to investors the purpose of the Expansion and Guard Bands. They wrote, "Guard bands were necessary in the old analog system to create a guard or barrier from one frequency to another. The expansion bands were created to have additional bands of spectrum available if needed to expand. Neither are needed in the digital world."[108] This is not true. As explained in Section III.A, the FCC approved the rebanding plan after digital technology had already been operating in the 800 MHz band (ESMR is digital), and the FCC required that Guard Bands be put in place to separate different system architectures.

53. In the 800 MHz Guard and Expansion Bands, a channel license authorizes the use of a maximum bandwidth of 20 kHz (20,000 Hz) in these bands.[109] The cellular voice and data technology used by major wireless providers requires a minimum bandwidth of 1.25 to 1.4 MHz (1,250,000 to 1,400,000 Hz).[110] Anything less than this minimum is incompatible with the systems used by the major wireless providers. As the channels at issue are 20,000 Hz, they are orders of magnitude smaller than the absolute minimum needed to be useful to the major wireless carriers—1.25 million Hz.[111]

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[108] Letter to Expectrum Partners from Terry Johnson and Ray Chadwick, Exhibit 71, pp. 3-4.

[109] 47 CFR § 90.209(b)(5), Table 1.

[110] Michael Wilhelm Declaration, Exhibit 311, ¶ 5, July 17, 2014.

[111] Michael Wilhelm Declaration, Exhibit 311, ¶ 5, July 17, 2014.

54. In some bands, the FCC allows a licensee to combine adjacent spectrum to make contiguous spectrum and in turn increase the bandwidth (equivalent to adding lanes on the highway). Even if it were possible to accumulate multiple channels in the Guard and/or Expansion Bands, this spectrum would still be incompatible with the systems of any of the major wireless carriers. As the channels are each only 20 kHz, the minimum compatible bandwidth would require 63 adjacent channels, all with waivers, either of which is highly unlikely. If granted, a waiver would allow license holders to use the spectrum for a use other than is permitted under the regulatory regime.[112] The FCC explains that it would be very hard to get a waiver to operate a high-density cellular system in the Guard or Expansion Bands: "Most importantly, were we to decide, here, to allow unrestricted, high density cellular operation in the non-cellular portion of the band, we would undo four years of intensive study and terminate this proceeding by virtually issuing an invitation for a high-density, multi-cell operator to construct interference-generating systems in incompatible spectrum and potentially put our first responders at risk and threaten their ability to adequately address Homeland Security threats."[113]

55. Beyond those reasons why the Guard and Expansion Band spectrum is not valuable to major wireless carriers, Sprint publicly stated that they were not able to buy spectrum in those bands. In an article in an industry publication, Bill Jenkins, Sprint's vice president of spectrum management said, "Sprint is forbidden from holding channels between 851 MHz and 862 MHz."[114] 860 to 862 MHz are the Expansion and Guard bands. The same article noted that, while it may seem that the Guard and Expansion Bands would be appealing to Sprint, who has 14 MHz of continuous spectrum next to the Guard Band, many of the licenses being offered are "site-specific licenses for just

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[112] For more detail about this process, see my Declaration in Support of Plaintiff in *Securities and Exchange Commission v. Janus Spectrum LLC et al.* (2:15-CV-00609-SMM), dated October 6, 2016, ¶ 25.

[113] Fifth Report and Order, p. 93.

[114] "Fair warning from Sprint: We can't buy 800 MHz spectrum we just returned to the FCC," Exhibit 318, October 21, 2014.

one or two channels." Recall that a channel has a 20 kHz bandwidth, which, as explained previously, is too small to be useful to a major wireless carrier. Moreover, the FCC does not allow the sale of one of these licenses until it has an operating radio system.[115]

56. Consistent with Sprint's warning, Michael Wilhelm, the Deputy Chief of the Policy and Licensing Division of the Public Safety and Homeland Security Bureau of the FCC, has declared that "neither Sprint nor any other cellular carrier would currently be allowed by the FCC to operate a CDMA (or LTE) system on an Expansion Band or Guard Band channel, by way of a lease from the licensee thereof, or otherwise."[116]

57. The charged co-conspirators represented that they planned to sell or lease the channel back to Sprint because they assumed that Sprint still had the towers set up to broadcast on those channels. While it may have been the same channel, there were new restrictions on its use. Moreover, Sprint had changed the technology of its system, and it would have been nontrivial to reconfigure the towers to broadcast at the old spectrum.[117] Even if the FCC were to have allowed Sprint to use that old

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[115] The FCC regulations state, "A license to operate a conventional or trunked radio system may not be assigned or transferred prior to the completion of construction of the facility." (47 CFR 90.609); "Fair warning from Sprint: We can't buy 800 MHz spectrum we just returned to the FCC," Exhibit 318, October 21, 2014.

[116] Michael Wilhelm Declaration, Exhibit 311, p. 2, July 17, 2014. David Alcorn had Mr. Wilhelm's contact information, but did not contact him to determine if Guard Band or Expansion Band licenses could be sold to or used by major wireless carriers. See, e.g, Email from Tina Ellis to David Alcorn, Exhibit 312, August 5, 2011. In any event, the evidence indicates that Mr. Alcorn was aware of those limitations from other sources, including directly from Sprint. Deposition of David Alcorn, March 15, 2016, pp. 103-104. See also, Testimony of Jack Forrest, June 26, 2014, pp. 42-44. See also, Email from Kent Maerki to David Alcorn, Exhibit 315, November 24, 2010 (Peter Moncure, a spectrum coordinator, wrote in response to an information request by Mr. Alcorn , "…as you are probably aware the Expansion and Guard bands are currently frozen—and offer limited opportunities as well.") In another email, Mr. Moncure wrote to Mr. Alcorn that "we could and probably should explore other opportunities than expansion-and-guard bands, which I view as almost a waste of time." See Email from Peter Moncure to David Alcorn, Exhibit 317, February 2, 2012.

[117] Sprint Nextel publicly made comments that, as part of their "Network Vision initiative" they were moving all of their systems away from iDEN (an ESMR system) to CDMA and LTE. In the Matter of Improving Spectrum Efficiency Through Flexible Channel Spacing and Bandwidth Utilization for Economic Area-based 800 MHz Specialized Mobile Radio Licenses. Comments of Sprint Nextel

spectrum (and there is no indication it would have), it certainly would not have been as easy as simply flipping a switch.

58. In order for Sprint or wireless carriers to operate their cellular systems in the Guard Band or Expansion Band, they would have required a waiver from the FCC to do so. The FCC was highly unlikely to grant such a waiver because it would have largely defeated the whole purpose of the rebanding effort.[118] The charged co-conspirators appear to have understood that a waiver was required. However, from my review of the available materials, I am not aware of the charged co-conspirators having sought a waiver from the FCC to sell or lease the spectrum back to Sprint, or to any other wireless carriers, or that they advised their investors of the risk that, without such a waiver, they would not be able to sell or lease the spectrum to wireless carriers.[119] Even with a waiver, by 2014, the systems Sprint was using were completely different and incompatible with the narrow spectrum bandwidths associated with the Guard Band and Expansion Band. Furthermore, the systems Sprint was using in 2004, when the reconfiguration started, were far different than what it was using in 2014. So, even with a waiver, Sprint could not simply go back and turn on their old tower again, even if the appropriate bandwidth were available. The equipment is gone—they would have sold that equipment when they relinquished those channels.

59. Furthermore, even assuming that a waiver had been granted and that it would have been possible to use the licenses for cellular services, the major wireless carriers are now using LTE technology, which, as stated earlier, requires a minimum channel

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Corporation, WT Docket No. 12-64, April 13, 2012, pp. 3-4. Note that Sprint Nextel had been making comments about their transition to CDMA and LTE since 2011: "Sprint announced in late 2011 that [it] would decommission its Nextel iDEN service on its 800 MHz spectrum beginning in 2013." ("Sprint details plans to shut down iDEN cell sites," Fierce Wireless, February 7, 2012, http://www.fiercewireless.com/story/sprint-details-plans-shut-down-iden-cell-sites/2012-02-07).

[118] Deposition of Terry Johnson, April 20, 2016, pp. 160-162; Deposition of David Alcorn, March 15, 2016, pp. 173-174.

[119] Fifth Report and Order, p. 15. The FCC draws a clear delineation between the "non-cellular portion" and "cellular portion" of the 800 MHz spectrum and clearly places the Guard Band in the "non- cellular portion."

width of 1.2 MHz. It would take 60 contiguous channels in the 800 MHz Expansion and Guard Bands to achieve a bandwidth of 1.2 MHz. The charged co-conspirators had at most a few channels in any license area. Furthermore, those channels typically were in the middle of the Guard and Expansion Bands, making them non-contiguous with frequencies outside of those bands.

60. The charged co-conspirators told potential investors, "The FCC does not allow any entity or individual to own more than one guard band and one expansion band in each [economic area]."[120] Other offering documents stated that the charged co-conspirators were planning to apply for five channels.[121] Even if they were applying for five channels, they would have only had 8.3% of the minimum bandwidth needed to use LTE. The charged co-conspirators also told investors, "We are only applying for one guard band in each EA. Janus was assured by the coordinator himself that they would get each of the licenses they apply for."[122]

61. The possibility of using Guard and Expansion Band licenses for Internet of Things (IoT) applications was raised by Peter Lewis as an alternative to the commercial mobile services.[123] IoT applications are so-called machine-to-machine communications where non-human devices are generating the communications traffic. Typical applications envisioned include wearables, smart grid and smart home applications, traffic monitoring and industrial applications such as supply chain management.[124] These applications are often narrowband, not requiring the wireless bandwidths needed to support commercial mobile broadband customers. IoT is often discussed in connection with 5G communications services, and is often envisioned as

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120 Letter to Expectrum partners from Terry Johnson and Ray Chadwick, Exhibit 71, p. 5.

121 Janus Spectrum Group Investment Offering, Exhibit 89, p. 5, August 2012.

122 Letter to Expectrum partners from Terry Johnson and Ray Chadwick, Exhibit 71, p. 5.

123 Janus Workshop on Emerging Technologies for Connectivity & Communications, Washington D.C., June 24, 2014, Exhibit 319, pp. 2-4.

124 Jyotsna, "10 Major Applications of IoT You Should Know," Jigsaw, March 6, 2021, https://www.jigsawacademy.com/top-uses-of-iot/.

provided over those networks, in addition to some stand-alone IoT network applications. Although it may be possible to use the Guard and Expansion Band licenses for some IoT applications, they do not justify the valuations based on using larger bandwidths of spectrum for commercial mobile applications. This is because these applications are not expected to be anywhere as profitable as the business models supporting mobile broadband applications. In addition to only supporting narrowband operations, any IoT networks supported by Guard and Expansion Band licenses would suffer from the fragmentation problem of not being able to offer large regional or national networks, further diminishing the value of these networks.

B. VALUE OF AND RETURNS ON 800 MHZ EXPANSION BAND AND GUARD BAND SPECTRUM WERE OVERSTATED

62. Charged co-conspirators admit that they were not experts in the valuation of wireless spectrum.[125] They could have hired an independent third-party valuation expert to advise on how much the Expansion and Guard Band licenses were worth. They did not.[126] Instead, they based their valuations on what they purportedly learned while working at Smartcomm.[127] What they provided to potential investors was an incomplete and partial analysis that presented a grossly misleading picture of the potential value of the licenses. Further, Mr. Alcorn's lawyer, Alan Tilles, a specialist in FCC spectrum issues, wrote to Mr. Alcorn that the valuations he saw in the Janus bankruptcy plan "makes me ill. A Des Moines license for an 800 MHz Guard Band channel worth $2.5 million? You're kidding me, right? The annual income from a license in Seattle is $840,000? I'm sick to my stomach. I really want out of this."[128] The charged co-conspirators undertook three valuation methods. Below I explain the flaws in their methodology and assumptions.

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[125] Deposition of David Alcorn, March 15, 2016, p. 135; Deposition of Kent Maerki, January 26, 2016, p. 88:22-25.

[126] Deposition of David Alcorn, March 15, 2016, p. 82.

[127] Deposition of David Alcorn, March 15, 2016, p. 82.

[128] Email from Alan Tilles to David Alcorn, Exhibit 458, August 2, 2014.

1. Spectrum Comparables

63. When discussing the value of the available spectrum, Mr. Maerki cites spectrum valuations from the FCC. "What is this worth? When the FCC did the swap with Sprint and Nextel, they said the Swiss cheese was worth $1.49, and the clean and contiguous was worth $1.70. What that means, from a valuation standpoint, is if you have an area – and I'm going to discuss this area – of about 600,000 people, when the FCC hands you their grant, according to their valuation, it's worth $180,000. That's just an appraisal, no better than your home appraisal by your county assessor."[129]

64. This comparison is incredibly misleading. The spectrum being valued at $1.70/MHz-pop was the (5 MHz + 5 MHz) PCS G Block that Nextel was being given to offset the costs of the rebanding of the 800 MHz spectrum at issue here. The PCS G Block (in the 1,900 MHz or 1.9 GHz range) was an extension of the PCS spectrum sold at auction in the mid-1990s. This is well-established broadband spectrum with a mature ecosystem and tens or hundreds of millions of customers. It is completely unlike the spectrum at issue in this case. As noted above, even the $1.49 figure was a valuation in the context of reorganization of the band for spectrum that was already being used in an integrated national commercial network. Further, the spectrum valued had significantly less restrictive rules of use than the Expansion and Guard Band licenses at issue here. Hence, Mr. Maerki's statements regarding the value of the spectrum is something like noting what the Empire State building was valued at when discussing swampland in Florida.

65. Mr. Maerki further claimed in his "Money From Thin Air" presentation, that the "Auction of 2008, winning bidders paid an average of [$3.65] a pop in markets of a half-a-million or more. Not $1.49 or $1.70. We've never seen anything this low again."[130] The claim of "$3.65 a pop in markets of a half-a-million or more" is very

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[129] Audio transcription of "Money from Thin Air," Exhibit 21, pp. 32-33.

[130] Audio transcription of "Money from Thin Air," Exhibit 21, p. 32.

misleading as a measure of value for Guard and Expansion Band spectrum. The reference is to the 700 MHz auction in 2008.[131] As an initial matter, that auction sold licenses of wide bandwidths, ranging from 6 MHz to 22 MHz—not 20 kHz narrowband licenses available in the Expansion and Guard Bands. In that auction the average price of all spectrum licenses sold was $1.28/MHz-pop.[132] The price of individual bands ranged from $0.65/MHz- pop to $2.70/MHz-pop.[133] To claim "$3.65 a pop" Mr. Maerki cherry picked the auction results, used the highest priced band, and then restricted it to the larger markets that sell for above average prices.

66. Further, marketing materials from Premier Spectrum Group mischaracterized the spectrum at issue: "This spectrum is in close proximity to spectrum for which AT&T and Verizon paid nearly $17 billion in 2008; it is these channels on which both carriers are building out their modern LTE networks."[134] This is another reference to the 700 MHz auction in 2008. As noted above, although the spectrum in the Guard Bands is near the 700 MHz band, it is not similar in how it is configured (narrow versus wide bandwidths) and has severe restrictions on how it can be used (restrictions on cellular architecture).

67. In the "Money From Thin Air" presentation, Mr. Maerki stated, "Again, AT&T paid in the same year $16.10 a pop, not $1.49, not $1.70, not $3.65; $16.10. And then Verizon paid $22.72 for rural cellular, and Paul Allen of Microsoft sold some stuff for

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131 I was a bidder for Cox Communications in that auction.

132 The auction raised $19 billion in net bids, selling 52 MHz of spectrum, covering 285 million people (based on 2000 census numbers). See "Auction 73, 700 MHz Band," FCC, http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=73 and U.S. Census Bureau, "Resident Population and Apportionment of the U.S. House of Representatives: Census 2000," United States, District of Columbia, and Puerto Rico Tables, https://www.census.gov/library/visualizations/2000/dec/2000-resident-population.html.

133 Coleman Bazelon, "Too Many Goals: Problems with the 700 MHz Auction," Information Economics and Policy 21 (2009), pp. 115–127, Figure 3.

134 Premier Spectrum Group Membership Fee Offering 2013, Exhibit 19, p. 7.

$40 a megahertz pop."[135] Again, this representation as an indicator of spectrum value is very misleading. He is comparing a per pop number—the value per person covered—to a per pop per MHz number—the value of the per pop number divided by the number of MHz in the transaction. It is also unclear if the transaction was for just spectrum, or for a developed cellular business complete with customers and infrastructure.

68. In its opposition to the SEC's motion to freeze its assets, Janus cited a 2015 paper of mine that was co-authored with my former colleague Giulia McHenry, now Chief of the Office of Economics and Analytics at the FCC, where we provided estimates of spectrum value.[136] In that paper, we explained that, based on historical relative spectrum prices, we believed that paired spectrum below 1 GHz is worth 30% more than the so-called Advanced Wireless Services Spectrum ("AWS").[137] We wrote, "Given frequencies and ecosystem availability, we expect that 700 MHz, Cellular and SMR spectrum all have similar values. ... This 30 percent premium suggests that the price for sub-1 GHz paired spectrum bands is now approximately $3.25 per MHz-pop."[138] The SMR spectrum discussed in this document refers to Nextel's rebanded SMR spectrum and not the Guard and Expansion Bands.[139]

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135 Audio transcription of "Money from Thin Air," Exhibit 21, p. 33; Deposition of David Alcorn, March 15, 2016, p. 82; Deposition of Daryl Bank, June 11, 2014, p. 142.

136 Coleman Bazelon and Giulia McHenry, "Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy" (May 2015), https://api.ctia.org/docs/default-source/default-document-library/brattle_spectrum_051115.pdf.

137 AWS spectrum is spectrum that the FCC has allocated to fixed and mobile terrestrial wireless services with bandwidths suitable for voice and data (including video). "Advanced Wireless Services (AWS)," FCC, https://www.fcc.gov/wireless/bureau-divisions/broadband-division/advanced-wireless-services-aws.

138 Coleman Bazelon and Giulia McHenry, "Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy" (May 2015), pp. 12-13, http://www.ctia.org/docs/default- source/default-document-library/brattle_spectrum_051115.pdf.

139 Coleman Bazelon and Giulia McHenry, "Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy" (May 2015), p. 9,http://www.ctia.org/docs/default-source/default-document-library/brattle_spectrum_051115.pdf.

69. Overall, the charged co-conspirators use of the value of so-called comparable spectrum was very misleading because the spectrum assets underlying the valuations cited were not comparable to the licenses available in the Expansion and Guard Bands.

2. Valuation Based on Leasing Spectrum to a Major Wireless Carrier

70. The charged co-conspirators also presented *pro forma* valuations based on leasing the spectrum to major wireless carriers. In an email to Mr. Bank, Mr. Alcorn noted that an estimated value of 5 channels in the top 25 Economic Areas would be "approximately $61.1 million."[140] He calculated this by multiplying a population of 164,780,747 by a spectrum value of $1.49/MHz-pop by .25 MHz of spectrum.[141] It is not clear where Mr. Alcorn is getting .25 MHz, as each channel in the Guard and Expansion Band is 20 kHz (0.02 MHz). They would need 12.5 channels to get 0.25 MHz (12.5 * 0.02 MHz = 0.25 MHz). If Mr. Alcorn is intending to value five 0.02 MHz channels in the top 25 EAs with an assumed value of $1.49, the correct calculation would be 164,780,747 pop * $1.49/MHz-pop * 0.1 MHz of spectrum for a total of $24.6 million. Without even challenging the $1.49/MHz-pop (which is far too high, as I discuss below), simply correcting Mr. Alcorn's math mistake reduces the estimate by $36.8 million.

71. The apparent goal of Mr. Alcorn's calculation was to value five channels (each with a bandwidth of 0.02 MHz, for a total of 0.1 MHz) in the top 25 Economic Areas. Even if the channels were contiguous (which would be highly unlikely)[142], and if they obtained a waiver to use high-density cellular (highly unlikely given the purpose of establishing the Guard and Expansion Bands), it would be of no value to a major

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[140] Email from David Alcorn to Daryl Bank, Exhibit 235, p. 2, June 30, 2012.

[141] Email from David Alcorn to Daryl Bank, Exhibit 235, p. 2, June 30, 2012.

[142] Deposition of Kent Maerki, May 15, 2014, p. 253. "Q: What is the probability that entities are going to be getting chunks [of spectrum] right next to each other? A: I think it's low."

wireless carriers, as explained in Section V. the technology they use requires a minimum of 1.25 MHz. To get to that bandwidth, they would need 62.5 contiguous Guard Band or Expansion Band channels, not the five Mr. Alcorn is valuing.

72. In his "Money from Thin Air" presentation, Mr. Maerki gives a specific example of potential revenue from leasing wireless spectrum in Economic Area 27 (Aiken and Augusta, Georgia). He explained that, according to the 2000 U.S. Census, that area had a population of 605,000. "Spread out about 7.5 percent of the marketplace, or 45,000 customers, in Akin/Augusta area, spending about 60 bucks a month for a total income – here we go, money from thin air – 2,700,000."[143] He then assumes operating margins of 40% and concludes the profit is at least one million dollars per month.[144] "They have 360 channels in that area. Divide that into the millions, they are talking about $3,000 a channel. Your license in that area, should you select to be in that area, would be for four channels times $3,000 or $12,000 a month. Wow."[145] … "[Sprint or somebody like them] will probably lease it back to you and pay you $4,800 a month."[146]

73. On its website, the FCC explicitly warns against license speculation, "A venture which seeks to obtain immediate, short-term profits from ownership of an FCC licensed or authorized service is a high-risk enterprise. Investors can and do lose money. In evaluating your risk tolerance, you should consider whether you can afford to lose your entire investment. If it sounds too good to be true, it probably is. … Be skeptical of any representation that the venture will quickly sell the license or authorization to another company for a huge profit. Sales of systems typically involve

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143 Audio transcription of "Money from Thin Air," Exhibit 21, p. 34.

144 Audio transcription of "Money from Thin Air," Exhibit 21, p. 34.

145 Audio transcription of WPSL Radio Show, Exhibit 23, p. 32.

146 Audio transcription of WPSL Radio Show, Exhibit 23, p. 33; Audio transcription of "Money from Thin Air," Exhibit 21, p. 34.

a long and complex process."[147] The value that Mr. Maerki was suggesting was indeed "too good to be true."

74. In one of Janus Spectrum's *pro formas*, they estimate an average annual return of 862% for five channel licenses in the top 25 EAs.[148] The net annual spectrum lease payment associated with these licenses is $16,155,386.

75. These estimates are based on a relatively simple calculation. They start with the population of the Economic Area from the 2000 Census, and they project that a given major wireless carrier will have a 7.5% market penetration. 7.5% of the EA population gives the number of subscribers, and they assume that each subscriber pays $60 per month. Monthly operating revenue for the carrier is then calculated as 7.5% of the EA population multiplied by $60. Janus Spectrum assumes an operating margin of 40% of the operating revenue, giving them a value for monthly cash flow.

76. From there, they assume that there were 360 paired channels that were used by the carrier to generate this revenue. According to their draft *pro forma* in Exhibit 331, 360 "represents the number of channels assumed to be within each economic area once all licenses have been granted."[149] Next, they calculated the monthly cash flow per channel by dividing the cash flow by the number of channels (360). They then assume that there are five channels that could be leased to the carrier and that each one of these earns the same monthly cash flow as each of the 360 channels for that EA. They calculate a monthly cash flow for all acquired channels by multiplying the monthly cash flow per channel by the number of acquired channels (five) and then assume that the lease payment would be 40% of the cash flow for the acquired channels. The *pro forma* assumes that Janus would collect 18% of this net monthly spectrum lease payment as commission, and the remaining 82% would go to

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147 "Wireless Telecommunications Investment Scams," FindLaw, March 26, 2008, https://corporate.findlaw.com/law-library/wireless-telecommunications-investment-scams.html.

148 Janus Spectrum pro forma, Exhibit 113.

149 "Pro Forma Assumptions and Explanations," Exhibit 331, p. 5.

investors. The annual return is calculated by dividing the net annual spectrum lease payment (the monthly net spectrum lease payment multiplied by 12) by an acquisition cost of $75,000.

77. There are several fatal flaws with this analysis. Aside from the fact that the licenses at issue are virtually worthless to a major wireless carrier, they are using Economic Areas (EAs), which are very large metropolitan areas that may even span several states. For example, the top EA is listed as "NYC-Long Is. NY-NJ-CT-PA-MA-VT" with a population of more than 25 million.[150] Clearly, this is a very large area—much larger than the licenses at issue in this case. The licenses at issue in this case do not cover the entire EAs, but rather cover much smaller ranges, all measured as a distance from a fixed point. The majority of licenses in this case have a radius of 20 kilometers (12.4 miles), which would cover only a small fraction of the population the EAs cover. This would decrease any lease payment significantly. Furthermore, their calculation does not account for the fact that if there were more channels available, there would be fewer subscribers per channel.

78. The charged co-conspirators passed the *pro forma* valuation documents on to an attorney they hired to review private placement documents, Nathaniel Dodson. Mr. Dodson questioned the assumptions in the *pro forma*, expressed concerns regarding valuation, and requested supporting documents.[151] Dodson asked for further explanation on how the charge co-conspirators came up with a 500% annual return.[152] The charged co-conspirators replied by saying lease rates were based on assumptions of industry norms from publicly available information provided by publicly traded wireless carriers.

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150 Janus Spectrum pro forma, Exhibit 113, p. 1.

151 Email from Nathaniel Dodson to David Alcorn, Exhibit 327, p. 2, February 1, 2012.

152 Email from Nathaniel Dodson to David Alcorn, Exhibit 330, February 14, 2012.

3. Valuation Based on Monetization through RapidLink Wireless

79. The charged co-conspirators' later attempt to monetize their licenses involved a company known as RapidLink Wireless.[153] The president of that company, Bob Labine, a long-time associate of David Alcorn,[154] did not have any expertise in managing or monetizing spectrum licenses. RapidLink's business model was based on deploying a dispatch-type system in certain towns in which it has licensed spectrum.[155]

80. In a RapidLink Wireless status report dated July 10, 2015,[156] with respect to Motorola TRBO radios, the authors note, "Our system requires a city wide or regional mosaic of RF coverage area, not pinpoint locations, supported by overlap and enough frequencies to allow growth of the customer base. In many past cases and continuing on current designs, the locations awarded by the FCC are many times not optimum for a mosaic coverage solution and have required new locations, FCC license modifications and new licenses to be acquired. We have worked with the license holders and the FCC to make the modifications in a timely manner."[157] If investors did decide to deploy a single site, RapidLink notes that there would be low demand for such a system.[158] In turn, that use of the license would be worth far, far less than a broadband usage.

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153 Email from Bob LaBine to Bobby Jones, Exhibit 292, August 12, 2014.

154 Email from David Alcorn to Bob Labine and others, Exhibit 326, October 17, 2011.

155 RapidLink Wireless Build Out Plan Overview, Exhibit 337, October 27, 2015.

156 RapidLink Wireless Status Report, Exhibit 352, July 10, 2015, p. 7.

157 RapidLink Wireless Status Report, Exhibit 352, July 10, 2015, p. 7.

158 "The deployment of a single site, even on a taller tower, without the support from the regional coverage contributed from multiple sites would result in a low initial subscriber loading of the system as delivery vehicles, taxis and businesses have regional needs more than site specific coverage [sic]."… "This site [DeMoines, Iowa] demonstrates the difference of finding a site with available frequencies (middle of rural market) versus building a radio system in cities with substantial population centers." RapidLink Wireless Status Report, Exhibit 352, July 10, 2015, p. 14.

81. The RapidLink *pro forma* analysis estimates a five-year income of $1,264,420 for a license owner.[159] This is based on adding 200 subscribers each month from month 7 to month 31, for a total of 5,000 subscribers. RapidLink assumes revenue of $30 per unit, broken down to $25 per unit for airwave usage and $5 per unit for a specialized business application (TRBO app).[160] Mr. Alcorn was warned by Peter Lewis that these numbers were not realistic because many companies are now using cellular phones to dispatch field workers and that 200 new customers per month is not a realistic assumption.[161]

82. The income estimates are wholly dependent on the number of subscribers, as that is the only source of revenue. The subscriber estimates are based on RapidLink's assumption that 10% of the Nextel subscribers would need a push-to-talk ("PTT") solution. Nextel had 24 million units when the population of the U.S. was about 240 million, or about 10% of the population. RapidLink assumed that their market was 10% of Nextel's market, or 1% of the U.S. population.[162] Mr. LaBine also noted that he assumed that there is demand for these products based on the fact that there are 440 Motorola dealers in the U.S. and that they tell him there is demand.[163]

83. RapidLink claimed that it would attempt to build a PTT network that spanned multiple geographic areas. Mr. LaBine cites anecdotal evidence that there is demand for this. He knows of one specific client that "goes between Colorado and Minnesota every day," and he believes that RapidLink could get their business if RapidLink's coverage went from Colorado to Minneapolis.[164]

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159 Pro forma for Rapidlink wireless, Exhibit 342, December 9, 2014, p. 12.

160 Pro forma for Rapidlink wireless, Exhibit 342, December 9, 2014.

161 Email between Peter Lewis and David Alcorn, Exhibit 434, March 16, 2015.

162 Deposition of Robert Labine, April 8, 2016, p. 157.

163 Deposition of Robert Labine, April 8, 2016, p. 157. RapidLink also assumes that tower lease costs are between $400 and $2,500 per month (Deposition of Robert Labine, April 8, 2016, p. 165).

164 Deposition of Robert Labine, April 8, 2016, pp. 158-159.

84. The problem with the RapidLink *pro forma* analysis is that it is much too optimistic. As an initial matter, the level of customer demand assumed is extremely optimistic. Using a percentage of Nextel's push-to-talk subscribers from a time before ubiquitous smart phones is hardly a reasonable basis for estimating potential demand. Furthermore, since RapidLink's business model rests on licensed spectrum that others could apply for and develop, any significant market demand they discover would quickly draw competitors into the market.

C. URGENCY OF LICENSE APPLICATION WAS OVERSTATED

85. Janus charged investors $40,000 per application. These funds were collected before the Public Notices were even filed. As discussed above, the Public Notices provided for a period of coordination before the filing window opened. There was no advantage to doing any of the application paperwork prior to this time because it did not create any priority in getting a license. Furthermore, the coordination work required to prepare an application (to make sure the applied-for license did not interfere with other licenses) does not take weeks or months—it could not have, given that some frequency coordinators charge only a few hundred dollars for the service. Consequently, Janus did not need to take any investor money before the Public Notice was issued.

D. JANUS CHARGED EXCESSIVE FEES FOR LICENSE APPLICATION SERVICES

86. Janus collected $40,000 per application from investors.[165] From that application fee, Janus paid large commissions to its sales representatives, sometimes as high as $21,500 per application.[166] Janus Spectrum compensates one of its Fundraising

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[165] "Janus Spectrum Application Services Agreement," Exhibit 211.

[166] Email between David Alcorn and Nathaniel Dodson (Mr. Alcorn's attorney), Exhibit 223, September 22, 2012; Janus compensates Dominion Investment Group 30% of its gross sales revenues to customers, Janus Spectrum agreement with Dominion Investment Group, Exhibit 322, July 17, 2012, p. 1.

Entities, Dominion Investment Group, 30% of client revenue.[167] Another Janus Spectrum Fundraising Entity, Premier Spectrum Group, compensates the sales agent 12% of all cash proceeds.[168]

87. In an email to Mr. Bank, Mr. Alcorn gave a breakdown of uses for funds from a $75,000 investment.[169] Less than 7% ($5,000) went to the coordinator and for FCC fees. Over 33% ($25,000) went to marketing and commissions, and an additional 13.3% ($10,000) covered admin, overhead, and profit.[170] If the application fees were not excessive, Janus would not have been able to allocate such large portions to marketing and commissions and overhead and profits.

What the Services Actually Cost to Provide

88. The actual cost of the application and frequency coordination (including the associated engineering) was significantly lower than the $40,000 the charged co-conspirators charged investors for these services.[171] For 18 applications for 112 frequencies, Janus paid a total of $40,980.[172] FCC filing fees for each application were $410, and the frequency coordination fee for each frequency was $300.[173] Mr. Terry Johnson, who worked with Mr. Alcorn, understood the cost associated with a license application to be "a few hundred dollars."[174] In other words, it appears that

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167 Janus Spectrum agreement with Dominion Investment Group, Exhibit 322, July 17, 2012.

168 "Member Independent Contractor Agreement," Exhibit 287, February 15, 2013; Email from Bobby Jones regarding commission, Exhibit 289, July 31, 2013.

169 Email from David Alcorn to Daryl Bank, Exhibit 235, p. 2, June 30, 2012.

170 Email from David Alcorn to Daryl Bank, Exhibit 235, p. 2, June 30, 2012.

171 Email from Tripp Forrest at Tusa Consulting to Peter Moncure and David Alcorn, Exhibit 385; Email from Peter Moncure to Tripp Forrest, Exhibit 386, December 4, 2012; Email between Peter Moncure and David Alcorn, Exhibit 391, January 9, 2015; RadioSoft invoice, Exhibit 392, February 10, 2015.

172 Email from Tripp Forrest at Tusa Consulting to Peter Moncure and David Alcorn, Exhibit 385; For alternative estimates see, Email from Peter Moncure to Tripp Forrest, Exhibit 386, December 4, 2012.

173 Email from Tripp Forrest at Tusa Consulting to Peter Moncure and David Alcorn, Exhibit 385; Email from Peter Moncure to Tripp Forrest, Exhibit 386, December 4, 2012.

174 Deposition of Terry Johnson, April 20, 2016, pp. 13-14.

Janus' actual application costs were approximately $2,300 per license, far less than the $40,000/license Janus charged investors.

89. As previously explained, the FCC requires that frequency coordinators submit the application package. The required FCC forms are FCC 601: FCC Application for Radio Service Authorization and FCC 159: Remittance Advice.[175] The FCC Filing Fee guide requires two fees: an application payment of $60 and a regulatory payment of $350 per call sign.[176] The FCC lists approved frequency coordinators on their website.[177] Many of these frequency coordinators list their charges on their respective websites. Form 601 fees are on the order of $250 to $500 per frequency pair per location.[178] Some coordinators may charge processing or administrative fees on the order of $200. All of these fees are orders of magnitude smaller than what the charged co-conspirators charged clients.

E. BUILD-OUT REQUIREMENTS WERE UNDERSTATED

90. While the charged co-conspirators did understand that the FCC required an operating tower to be functioning within one year of being awarded the contract, they misled investors with overly optimistic statements about the need to build towers or acquire equipment. They withheld a critical piece of information from their investors: the FCC does not allow the sale of certain license types unless the licensee had built and

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[175] The licenses at issue in this case are those with Radio Service Codes of GM, GB, YB, or YX. These codes are all classified as Site-Specific Land Mobile and require the FCC 601 application. See, "FCC 601 Main Form, FCC Application for Radio Service Authorization: Wireless Telecommunications Bureau Public Safety and Homeland Security Bureau," FCC, December 2020, pp. 7-8. FCC 159 is paperwork that must be included with any remittance to the FCC.

[176] Fees referenced refer to the 2012 Fee Filing Guide. "Wireless Telecommunications Bureau Fee Filing Guide," FCC, p. 22.

[177] "Industrial / Business Licensing," Federal Communications Commission, at "Frequency Coordinators," September 26, 2019, https://www.fcc.gov/wireless/bureau-divisions/mobility-division/industrial-business/industrial-business-licensing. The relevant grouping is 800/900 MHz Coordinators.

[178] See, for example: "MRFAC Services – Effective October 1, 2012," MRFAC, Inc., http://www.mrfac.com/ServiceFees.shtm; "Schedule of Services," Enterprise Wireless Alliance, https://www.enterprisewireless.org/resources/schedule_services; "Fees," Forest Industries Telecommunications, http://fcclicense.org/fit/?page_id=73.

operated a transmission system.[179] This is the case with the licenses at issue in this case.[180] The FCC established buildout requirements to ensure that spectrum is used efficiently.[181] If the licensee does not build a system within one year, the FCC cancels the license.[182]

91. Mr. Maerki also told investors "[Ownership of spectrum] is work free. There's just nothing to do. You look at your tower, and you don't see anything happening, and you go home."[183] He did not explain that it was necessary to start transmitting on the frequencies within one year of the license being awarded.

92. Mr. Maerki misled investors when he said, "I demand spectrum that's already in use with current income streams."[184] No channel that was available in the Guard or Expansion Bands that the charged co-conspirators were offering had any existing income stream. Any channels that were being used would have been moved as part of the rebanding. Mr. Maerki withheld from investors that the licenses they would receive would not have any income streams, and that investors would be on the hook for building out the channel within a year, a costly proposition.

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179 *Daniel R. Goodman, Solely in his Capacity as Receiver, Chadmoore Wireless Group, Inc., and SMR Services, Inc., et al., v. Federal Communications Commission and United States of America*, Court of Appeals No. 95-1585, July 16, 1999.

180 The licenses at issue are of four different service classes, GM, GB, YB, and YX. They all require construction and operation of a system to occur within one year of the license grant. Though it is possible to apply for extended implementation that allows construction for up to five years, this is reserved for very large or very complex systems. FCC, "Construction/Coverage Requirements," http://wireless.fcc.gov/licensing/index.htm?job=const_req_by_service.

181 "Spectrum Management: FCC's Use and Enforcement of Buildout Requirements," Government Accountability Office, Report to Congressional Requesters, February 2014, p. 8.

182 *Daniel R. Goodman, Solely in his Capacity as Receiver, Chadmoore Wireless Group, Inc., and SMR Services, Inc., et al., v. Federal Communications Commission and United States of America*, Court of Appeals No. 95-1585, July 16, 1999.

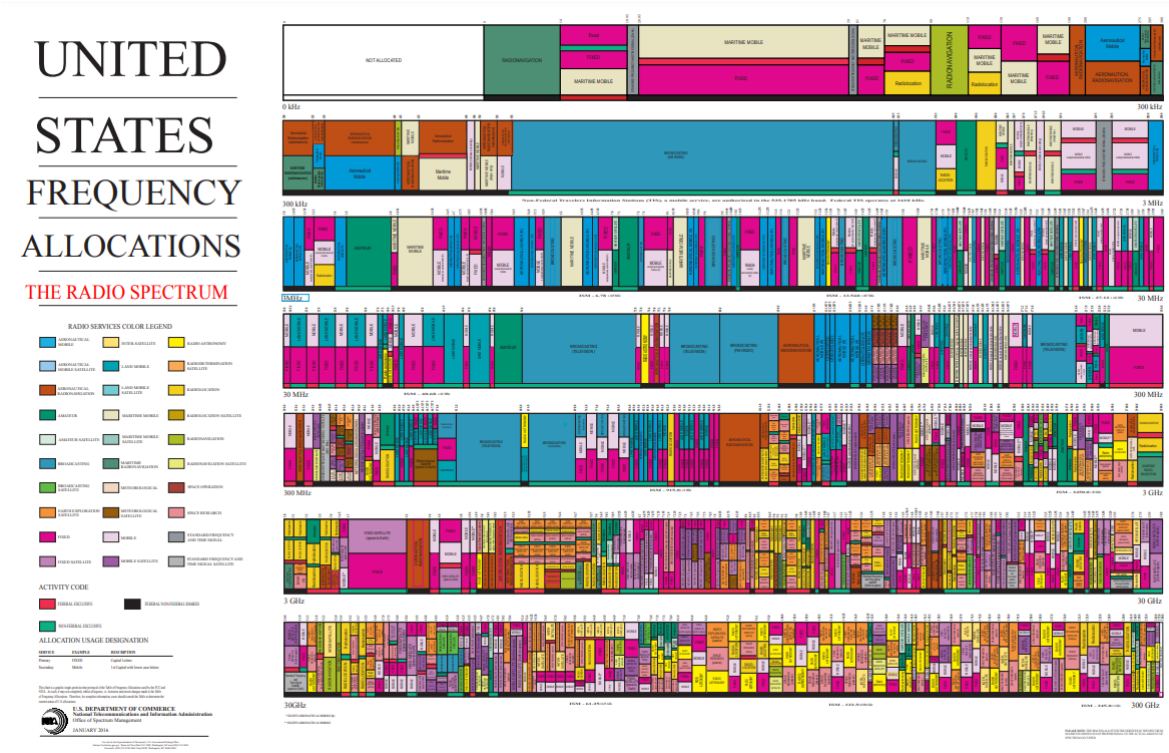
183 Audio transcription of "Money from Thin Air," Exhibit 21, p. 18.

184 Audio transcription of "Money from Thin Air," Exhibit 21, p. 20.

93. Mr. Alcorn was aware of the build-out requirements. He explained to Mr. Maerki in an email, "Most likely if we have not leased or sold the licenses within 12 months of issuance, we have huge problems."[185] However, he did not express the same concern to investors.

[185] Email from David Alcorn to Kent Maerki, Exhibit 323, February 3, 2012.

Appendix 1



Source: NTIA, "United States Frequency Allocation Chart," published January 2016, https://www.ntia.doc.gov/files/ntia/publications/january_2016_spectrum_wall_chart.pdf.

Note: For an updated table of frequency allocation see, FCC, "FCC Online Table of Frequency Allocations," Revised February 1, 2021, https://transition.fcc.gov/oet/spectrum/table/fcctable.pdf

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Dr. Coleman Bazelon is an economic expert with much of his practice focused in regulation, strategy, and valuation in the wireless, wireline, and video sectors. His practice encompasses the modern information infrastructure and the content that fills it. He has consulted and testified on behalf of clients in numerous telecommunications matters, including wireless license auctions and spectrum management; internet matters, including the broadband and applications markets; media matters, including in the programming and copyright markets; entertainment, including analyses of gaming markets; and sports, advising on economic matters related to baseball, Australian Rules Football, and the Olympics.

In addition to regulatory, policy, and valuation analyses, Dr. Bazelon's engagements have also focused on a range of issues within the intellectual property, including serving as an expert in patent and ITC matters, and competition areas. Throughout his career, Dr. Bazelon has had extensive experience with spectrum license auctions as well. He advises on and evaluates auction designs and regularly serves as an auction advisor for bidders in spectrum license auctions. Dr. Bazelon frequently advises regulatory and legislative bodies, including the US Federal Communications Commission (FCC) and the US Congress.

Prior to joining Brattle, Dr. Bazelon was a Vice President at an international economic and strategy-consulting firm. During that time, he expanded the firm's telecommunications practice area. He also served as a Principal Analyst in the Microeconomic and Financial Studies Division of the Congressional Budget Office (CBO) where he researched reforms of radio spectrum management; estimated the budgetary and private sector impacts of spectrum-related legislative proposals; and advised on auction design and privatization issues for all research at the CBO.

SELECTED CONSULTING PROJECTS

Litigation

- Provided Domestic Industry, Cease and Desist Order, and Bond testimony in ITC 337 case involving automated storage and retrieval systems.
- Provided Domestic Industry, Cease and Desist Order, and Bond testimony in ITC 337 case involving wireless routers and controllers.
- Testified in criminal trial about value of spectrum licenses.
- Testified on damages and injunctive relief for Canadian patents.
- Provided written testimony on lost profits of a pharmacy in the fertility industry.
- Provided written testimony on the ability to estimate refunds of prison phone commissions.
- Estimated value of stadium naming rights, in International Arbitration.
- Provided written testimony on the ability to estimate damages for a data breach class.
- Provided written testimony on the actual value of spectrum for a fraud matter.
- Estimated damages related to spectrum value in North America, in International Arbitration.

- Provided Domestic Industry testimony in ITC 337 case involving solid-state storage devices.
- Provided written testimony of the value of a satellite joint venture.
- Estimated damages related to spectrum value in India, in International Arbitration.
- Provided declaration on spectrum valuation for potential US Securities and Exchange Commission (SEC) fraud matter.
- Provided written testimony in private fraud case involving 700 MHz Guard and Expansion Band licenses.
- Provided testimony in ITC 337 enforcement case involving reusable coffee brewing cup patents.
- Provided written testimony in Virginia State Corporation Commission fraud case involving 700 MHz Guard and Expansion Band licenses.
- Provided testimony in SEC fraud case involving 700 MHz Guard and Expansion Band licenses.
- Estimated value of a spectrum portfolio.
- Developed auction format for sale of private equity management firm.
- Estimated racial impact of voter ID law in Texas.
- Assessed Domestic Industry requirement in ITC 337 case involving mobile location patents.
- Evaluated damages in the applications market.
- Assessed allocation theories in an international bankruptcy.
- Evaluated damages from a programming contract termination.
- Evaluated damages from allegations of reputational harm in gaming equipment market.
- Evaluated damages from non-working wireless network equipment.
- Assessed Domestic Industry requirement in ITC 337 case involving wireless equipment patents.
- Assessed commercial viability of full text searching of books business model.
- Assessed Domestic Industry requirement in ITC 337 case involving portable storage device patents.
- Estimated value of satellite assets in bankruptcy.
- Estimated damages from denial of pole attachments.
- Provided written testimony evaluating the performance of a numbering resource administrator.
- Provided written testimony on the ability to estimate damages for a class of satellite phone users.
- Provided written testimony on the economic value of rights-of-way in Massachusetts.
- Estimated damages for a broadcast tower permit revocation.
- Provided oral testimony on the proprietary nature of specific information contained in a statewide public safety network bid.
- Provided written testimony on economic value associated with items provided in a labor neutrality agreement.
- Estimated damages associated with Universal Service Fund (USF) and other telephone taxes paid by a calling card reseller.
- Assessed the damages associated with the infringement of patents related to Voice over Internet Protocol (VoIP) technology and the likely impact of a permanent injunction.
- Estimated recoverable data costs for two pesticides.
- Estimated cost of delay in granting local cable franchise.
- Analyzed the economic underpinnings of an exclusivity clause of a mobile phone affiliation agreement.
- Assessed commonality issues of physicians for class certification of Racketeer Influenced and Corrupt Organization (RICO) action against a set of health insurance companies.
- Estimated “loss of use” damages for a severed fibre optic cable.

- Provided written testimony estimating the value of a surety bond in a contract dispute involving toll free phone numbers used in an enhanced service application.
- Assessed damages associated with infringement of patents used to provide VoIP.
- Assessed basis for guidance of a large telecommunications firm in a 10-b securities litigation.
- Valued digital television radio spectrum in St. Louis in the pre-litigation phase of a breach of contract dispute.
- Estimated damages in a breach of contract case involving the sale of a fibre optic network.
- Researched the basis for generally optimistic forecasts of broadband deployment in the later 1990s and early 2000s in an antitrust litigation.
- Researched the basis for generally optimistic beliefs about the telecommunications sector in the late 1990s in a 10-b securities litigation.
- Assessed the market for Competitive Local Exchange Carriers in an SEC fraud case.
- Assessed a bankruptcy sale proposal for a national tier 1 broadband backbone provider.
- Examined the business case asserted for a small wireless reseller in a breach of contract litigation.
- Assessed damages associated with infringement of patents used in DNA fingerprinting applications.
- Assessed changes in contributions to the Cable Royalty Fund on behalf of Sports Claimants in a Copyright Arbitration Royalty Panel (CARP) proceeding.
- Assessed the capital adequacy of the US branch of a foreign bank.

Regulatory Proceedings

- Assessed discrimantory practices in broadband provision.
- Estimated value of 12 GHz spectrum.
- Assessed competitive issues in the broadband market for a Section 253 petition.
- Analyzed broadband speed claims.
- Provided comments on repurposing C-Band spectrum in Canada.
- Provided written testimony on prison phone rates.
- Reviewed and assessed comments on the costs and benefits of repurposing 5.9 GHz spectrum.
- Assessed the public interest benefits of a market-based solution for the C-Band spectrum.
- Assessed benefits of fibre-based broadband in rural areas.
- Analyzed impact of Canadian resale obligations.
- Analyzed approaches to repurposing C-Band spectrum.
- Analyzed competitive effects of proposed Sprint/T-Mobile merger.
- Provided written testimony on the costs and benefits of reallocating 900 MHz spectrum.
- Analyzed impact of forbearance on unbundling, resale, facilities access, and non-discrimination obligations.
- Provided written testimony on rates for TRS service.
- Assessed basis for mechanical royalties in copyright proceeding.
- Provided declaration on minority incentives in spectrum secondary market transactions.
- Evaluated proposed pole attachment rate.
- Analyzed costs of USPS.
- Assessed impact on incentive auction of unlicensed operations in guard bands.
- Assessed market power in Canadian wireless market.
- Provided testimony in prison phone rate proceeding.

- Estimated economic impact of local number portability (LNP) on rural local exchange carriers (RLECs).
- Assessed relevance of US UNE-L experience for New Zealand benchmarking proceeding.
- Authored analysis of harm from revoking LightSquared's Ancillary Terrestrial Component (ATC) authorization.
- Estimated value of pairing Upper 700 MHz A Block with public safety.
- Estimated impact of increased regulatory uncertainty on spectrum value.
- Estimated value of government provision of GPS service to private industry.
- Coauthored analysis of feasibility of reallocating broadcast television through the use of incentive auctions.
- Analyzed impact on spectrum value of pairing AWS III spectrum.
- Coauthored analysis of the merits of licensed versus unlicensed allocation of the TV white spaces.
- Estimated the value of TV white spaces.
- Provided written testimony on the economic harm of using proprietary information in retention marketing.
- Provided written testimony on the economics of pole attachment rates.
- Estimated the value of the PCS H-Block spectrum band.
- Estimated the economic impact of an ITC Exclusion Order on cell phone handsets.
- Authored several reports on the 700 MHz auction rules.
- Analyzed the relationship between the size of cable systems and the economics of the programming market.
- Presented analysis on pricing differentials in overlapping cable markets.
- Assessed proposed regulation of mobile phone roaming rates.
- Analyzed impact of local franchise requirements on competition in the video marketplace.
- Developed and assessed Indian spectrum management proposals.
- Analyzed economic ramifications of à la carte cable channel pricing on consumers and the cable and television programming industries.
- Examined the relative merits of licensed versus unlicensed radio spectrum and the effects of "underlay" licenses on existing commercial licensees.
- Examined federalism issues related to mobile telephone regulation.
- Examined and refuted arguments suggesting that the California Telecommunications Consumer Bill of Rights was an appropriate response to market failures.
- Assessed the impact on consumers of California's Telecommunications Consumer Bill of Rights proposal.
- Provided written testimony refuting analysis purporting to show a positive relationship between UNE-P and telecom network investment.
- Provided written testimony examining the effects of unbundling regulations on capital spending in the telecommunications sector.
- Estimated the adjustment to the total element long-run incremental cost (TELRIC) pricing formula to account for irreversible investment in the local telephone network.
- Examined the impact of irreversible investments in the local telephone network on the TELRIC pricing methodology.
- Assessed the degree of market overlap of two food service firms for purposes of merger review.
- Provided written testimony that assessed the validity of an analysis of the costs of a DTV tuner mandate.

- Provided written testimony of a forecast of toll free number demand for the toll free number administrator, SMS/800, in a rate case proceeding.

Other

- Advised bidder in FCC 3.45 GHz auction.
- Estimated economic impacts from a bankruptcy restructuring.
- Advised broadband provider on Federal Trade Commission (FTC) consumer protection/false-advertising investigation.
- Advised bidder in FCC RDOF auction.
- Advised bidder in FCC CBRS spectrum license auction.
- Advising bidder in FCC C-Band spectrum license auction.
- Estimated value of 900 MHz spectrum licenses for several clients.
- Estimated Value of 600 MHz, 900 MHz, 2.4 GHz, and 3.5 GHz licenses.
- Estimated the value created from an accelerated clearing of the C-Band spectrum.
- Analyzed value of repurposing lower mid-band spectrum.
- Analyzed impact of 5G on mobile spectrum values.
- Advised Afghanistan Telecom Regulatory Authority on spectrum licensing.
- Estimated value of spectrum portfolio.
- Auction planning and support for CAF II auction.
- Estimated value of spectrum pipeline.
- Provided support for Australian Rules Football collective bargaining negotiations.
- Provided support for Major League Baseball (MLB)/Major League Baseball Players Association (MLBPA) Collective Bargaining Agreement negotiations.
- Estimated value of new spectrum technology.
- Analyzed market for video relay services (VRS).
- Coauthored analysis of wireless technology on agricultural water use.
- Evaluated impacts of Boston 2024's Olympic bid.
- Estimated value of licensed mobile broadband spectrum.
- Estimated future needs for licensed mobile broadband spectrum.
- Advised bidder in Canadian 700 MHz auction.
- Evaluated performance of TV stations when repacked in an incentive auction.
- Analyzed differences in US and European wireless markets.
- Assessed business case and value of HF license holder.
- Analyzed likely auction outcomes for TV broadcaster participating in an incentive auction.
- Assessed value of commercial mobile spectrum bands.
- Analyzed economic impacts of the commercial casino industry.
- Evaluated impact of digitization on copyright industries.
- Analyzed economic and employment effects of Dutch gas hub.
- Advised bidder in Indian 3G spectrum license auction.
- Estimated economic and employment effects of network neutrality regulation.
- Analyzed relative costs of wireless and wireline deployments in rural areas.
- Analyzed potential harms from Internet gambling.
- Estimated economic value of reallocating TV spectrum for wireless broadband.
- Estimated economic and employment effects of electric power transmission construction in support of new wind generation facilities.
- Estimated economic and employment effects of broadband stimulus grant applications.

- Estimated employment effects of an ATC-mobile satellite network deployment.
- Analyzed the impact of reducing international mobile phone roaming charges.
- Developed an auction platform for an electricity procurement auction.
- Analyzed the economic impacts of reduced mobile phone taxes in Africa and the Middle East.
- Evaluated the impact of reducing ethanol requirements on gasoline prices.
- Analyzed fair, reasonable, and non-discriminatory (FRAND) licensing requirements for intellectual property in the DTV standard.
- Advised bidder in Canadian AWS spectrum license auction.
- Advised bidder in FCC 700 MHz spectrum license auction.
- Evaluated a business plan for proposed dam removals.
- Assessed a business plan involving the WiMAX market.
- Estimated the value of a portfolio of spectrum licenses.
- Assessed the budgetary impacts of legislation to license TV white spaces.
- Analyzed the economics of the military's build versus buy decision for broadband satellite communications capacity.
- Advised bidder in FCC AWS spectrum license auction.
- Provided framework to estimate impact of the effect of designation of TV white spaces as unlicensed on 700 MHz auction receipts.
- Analyzed Universal Service Fund expenditures.
- Analyzed cable-franchising requirements.
- Valued proposals to re-band the Upper 700 MHz Band of radio spectrum.
- Analyzed proposed accelerated digital television transition impacts on society and the federal budget.
- Coauthored a report on the value of a portfolio of patents used to provide VoIP.
- Coauthored a report to the US Chamber of Commerce on the economic effects of telecommunications deregulation.
- Assessed the business cases for indefeasible right of use (IRU) swaps of a large international fibre optic network owner.
- Examined the effects of unbundling regulations on broadband penetration internationally.

TESTIMONY AND DECLARATIONS

"Declaration of Coleman Bazelon and Paroma Sanyal," Public Utilities Commission of the State of California, *Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California*, Rulemaking 20-09-001, July 26, 2021.

"Rebuttal Witness Statemetn of Dr. Coleman Bazelon," In the Matter of *Certain Routers, Access Points, Controllers, Network Management Devices, Other Networking Products, and Hardware and Software Components Thereof*, United States International Trade Commission, Investigation No. 337-TA-1227, July 16, 2021.

"Rebuttal Witness Statemetn of Dr. Coleman Bazelon," In the Matter of *Certain Automated Storage and Retrieval Systems, Robots, and Components Thereof*, United States International Trade Commission, Investigation No. 337-TA-1228, July 1, 2021.

"Expert Report of Coleman Bazelon, PhD," *United States of America v. Daryl Bank, et al., Defendants*, United States District Court for the Eastern District of Virginia, Criminal Case No. 2:17-CR-126, March 16, 2021.

"Revised Reply Expert Report of Coleman Bazelon," *Rovi Guides, Inc. v. BCE Inc. Federal Court, Canada, Court File No. T-113-18, June 26, 2020 and Rovi Guides Inc. v. TELUS,* Federal Court, Canada, Court File No. T-206-18, June 26, 2020.

"Affidavit of Coleman Bazelon," *Rovi Guides, Inc. v. BCE Inc. Federal Court, Canada, Court File No. T-113-18, June 12, 2020 and Rovi Guides Inc. v. TELUS*, Federal Court, Canada, Court File No. T-206-18, June 12, 2020.

"Reply Expert Report of Coleman Bazelon," *Rovi Guides, Inc. v. BCE Inc. Federal Court, Canada, Court File No. T-113-18, May 12, 2020 and Rovi Guides Inc. v. TELUS*, Federal Court, Canada, Court File No. T-206-18, May 12, 2020.

"Expert Rebuttal Report of Coleman Bazelon Submitted on Behalf of Progyny, Inc.," *Schraft's 2.0, LLC, Claimant v. Progyny, Inc., Respondent*, AAA Case No. 01-19-0000-1248, April 20, 2020.

"Highly Confidential Reply Expert Report of Coleman Bazelon," *Rovi Guides, Inc. v. Videotron Ltd.*, Federal Court, Canada, Court File No. T-921-17, February 21, 2020.

"Expert Report of Coleman Bazelon," *Rovi Guides, Inc. v. BCE Inc.,* Federal Court, Canada, Court File No. T-113-18, January 29, 2020 and *Rovi Guides Inc. v. TELUS*, Federal Court, Canada, Court File No. T-206-18, January 29, 2020.

"Highly Confidential Expert Report of Coleman Bazelon," *Rovi Guides, Inc. v. Videotron Ltd.,* Federal Court, Canada, Court File No. T-921-17, November 11, 2019, revised on January 10, 2020.

"Declaration of Coleman Bazelon," In the matter of *Kellie Pearson and The Law Offices of Mark Booker, on behalf of themselves and those similarly situated, v. Thomas M. Hodgson, In His Official Capacity as Sheriff Of Bristol County and Securus Technologies, Inc.,* United States District Court, District of Massachusetts, Case No. 1:18-cv-11130, November 7, 2019.

"Declaration of Coleman Bazelon, Ph.D.," In the Matter of *Vertical Ventures II, LLC, et al., v. Smartcomm LLC, et al., and Smartcomm License Services, LLC, et al., v. Carla Marshall, an individual*, Superior Court of Arizona County of Maricopa, No. CV2015-009078, December 6, 2018.

"Declaration of Dr. Coleman Bazelon in Support of Plaintiff's Motion for Class Certification," In the matter of *Premera Blue Cross Customer Data Security Breach Litigation*, Case No. 3:15-md-2633-SI, August 3, 2018.

"Fourth Expert Report of Dr. Coleman Bazelon," In the Matter of *CC/Devas (Mauritius) Ltd., Devas Employees Mauritius Private Limited, and Telcom Devas Mauritius Limited,* Case No. PCA2013-09, April 26, 2018.

"Witness Statement of Dr. Coleman Bazelon," In the Matter of *Certain Solid State Storage Drives, Stacked Electronics Components, and Products Containing Same*, United States International Trade Commission, Washington, DC, Investigation No. 337-TA-1097, March 2, 2018.

"Third Expert Report of Dr. Coleman Bazelon," In the Matter of *CC/Devas (Mauritius) Ltd., Devas Employees Mauritius Private Limited, and Telcom Devas Mauritius Limited*, Case No. PCA2013-09, November 29, 2017.

"Testimony of Coleman Bazelon before the U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Communications and Technology," November 16, 2017. (5G Spectrum)

"Second Rebuttal Report – Reply to the Expert Report of J. Armand Musey in Opposition of Coleman Bazelon," In the Matter of *ATK Space Systems, Inc., et al., vs. U.S. Space LLC*, Circuit Court of Loudon County, Virginia, Case No. CL-101847, November 10, 2017.

"Rebuttal Report of Coleman Bazelon, Ph.D.," In the Matter of *ATK Space Systems, Inc., et al., vs. U.S. Space LLC*, Circuit Court of Loudon County, Virginia, Case No. CL-101847, October 20, 2017.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *ATK Space Systems, Inc., et al., vs. U.S. Space LLC*, Circuit Court of Loudon County, Virginia, Case No. CL-101847, September 8, 2017.

"Second Expert Report of Dr. Coleman Bazelon," In the Matter of *CC/Devas (Mauritius) Ltd., Devas Employees Mauritius Private Limited, and Telcom Devas Mauritius Limited*, Case No. PCA2013-09, July 31, 2017.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *Vertical Ventures II, LLC; Vertical Ventures V, LLC; LWH Network, LLC; L, W & C Network, LLC; and Spectrum Family 800, GP vs. Smartcomm, LLC; Smartcomm License Services, LLC; Smartcomm Management, LLC; Smartcomm Acquisitions, LLC; License Acquisitions, LLC; Big Wave Ventures, LLC; Spectrum Networks Group, LLC; M2M Spectrum Networks, LLC; Spectrum Acquisitions Group, LLC; Carlson Investment Group, LLC; Carole L. Downs; Barclay Knapp; and Joe Doe Transferees*, Superior Court of Arizona Maricopa County, March 24, 2017.

"Expert Report of Dr. Coleman Bazelon," In the Matter of *CC/Devas (Mauritius) Ltd., Devas Employees Mauritius Private Limited, and Telcom Devas Mauritius Limited*, Case No. PCA2013-09, January 16, 2017.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *Commonwealth of Virginia, ex rel. State Corporation Commission v. Darryl Gene Bank and Raeann Ann Gibson, Commonwealth of Virginia State Corporation Commission Hearing Examiner*, Case No. SEC-2015-00020, November 4, 2016.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *Certain Beverage Brewing Capsules, Components Thereof, and Products Containing the Same*, United States International Trade Commission, Washington, DC, Investigation No. 337-TA-929, November 2, 2016.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *Securities and Exchange Commission v. Janus Spectrum LLC; David Alcorn; David Alcorn Professional Corporation; Kent Maerki; Dominion Private Client Group,*

LLC; Janus Spectrum Group, LLC; Spectrum Management, LLC; Spectrum 100, LLC; Prime Spectrum, LLC; Prime Spectrum Management, LLC; Daryl G. Bank; Premier Spectrum Group, PMA; Bobby D. Jones; Innovative Group, PMA; Premier Group, PMA; Prosperity Group, PMA; Terry W. Johnson; and Raymon G. Chadwick, Jr., United States District Court, District of Arizona, Docket No. CV- 15-609-PHX-SMM, May 13, 2016.

"Amended Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *ACP Master, Ltd., Aurelius Capital Master, Ltd., and Aurelius Opportunities Fund II, LLC, v. Sprint Corporation, Sprint Communications, Inc., Erik Prusch, John W. Stanton, William R. Blessing, Bruce A. Chatterley, Mufit Cinali, Jose A. Collazo, Hossein Eslambolchi, Dennis S. Hersch, Brian P. McAndrews, Kathleen H. Rae, Theodore H. Schell, Jennifer L. Vogel, Slade Gorton, Starburst I, Inc., and Softbank Corp.*, Court of Chancery, State of Delaware, C.A. No. 8508-VCL and *ACP Master, Ltd., Aurelius Capital Mater, Ltd., and Aurelius Opportunities Fund II, LLC, v. Clearwire Corporation*, Court of Chancery, State of Delaware, C.A. No. 9042-VCL, November 2, 2015.

"Rebuttal Report of Coleman Bazelon, Ph.D.," In the Matter of *ACP Master, Ltd., Aurelius Capital Mater, Ltd., and Aurelius Opportunities Fund II, LLC, v. Sprint Corporation, Sprint Communications, Inc., Erik Prusch, John W. Stanton, William R. Blessing, Bruce A. Chatterley, Mufit Cinali, Jose A. Collazo, Hossein Eslambolchi, Dennis S. Hersch, Brian P. McAndrews, Kathleen H. Rae, Theodore H. Schell, Jennifer L. Vogel, Slade Gorton, Starburst I, Inc., and Softbank Corp.*, Court of Chancery, State of Delaware, C.A. No. 8508-VCL and *ACP Master, Ltd., Aurelius Capital Mater, Ltd., and Aurelius Opportunities Fund II, LLC, v. Clearwire Corporation*, Court of Chancery, State of Delaware, C.A. No. 9042-VCL, October 23, 2015.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *ACP Master, Ltd., Aurelius Capital Mater, Ltd., and Aurelius Opportunities Fund II, LLC, v. Sprint Corporation, Sprint Communications, Inc., Erik Prusch, John W. Stanton, William R. Blessing, Bruce A. Chatterley, Mufit Cinali, Jose A. Collazo, Hossein Eslambolchi, Dennis S. Hersch, Brian P. McAndrews, Kathleen H. Rae, Theodore H. Schell, Jennifer L. Vogel, Slade Gorton, Starburst I, Inc., and Softbank Corp.*, Court of Chancery, State of Delaware, C.A. No. 8508-VCL and *ACP Master, Ltd., Aurelius Capital Mater, Ltd., and Aurelius Opportunities Fund II, LLC, v. Clearwire Corporation*, Court of Chancery, State of Delaware, C.A. No. 9042-VCL, September 25, 2015.

"Expert Rebuttal Report on Domestic Industry of Coleman Bazelon, Ph.D.," In the Matter regarding *Certain Non-Volatile Memory Chips and Products Containing the Same*, Investigation No. 337-TA-916, December 15, 2014.

"Expert Report on Remedy and Bonding of Coleman Bazelon, Ph.D.," In the Matter regarding *Certain Non-Volatile Memory Chips and Products Containing the Same*, Investigation No. 337-TA-916, December 15, 2014.

"Expert Report on Public Interest of Coleman Bazelon, Ph.D.," In the Matter regarding *Certain Non-Volatile Memory Chips and Products Containing the Same*, Investigation No. 337-TA-916, November 24, 2014.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter regarding *Wynnchurch Capital Ltd.*, In the Court of Chancery of the State of Delaware, C.A. No. 10077-VCL, November 7, 2014.

"Third Amended Reply Report of Coleman Bazelon, Ph.D.," On Behalf of Plaintiff-Intervenors *Texas League of Young Voters Education Fund and Imani Clark*, United States District Court for the Southern District of Texas Corpus Christi Division, Civ. No. 2:13-cv-00263, September 22, 2014.

"Reply Report of Coleman Bazelon, Ph.D.," On Behalf of Plaintiff-Intervenors *Texas League of Young Voters Education Fund and Imani Clark*, United States District Court for the Southern District of Texas Corpus Christi Division, Civ. No. 2:13-cv-193 (NGR), August 15, 2014.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of the *Texas League of Young Voters Education Fund and Imani Clark v. State of Texas*, Nandita Berry, in her official capacity as Texas Secretary of State; and Steve McGraw, in his official capacity as Director of the Texas Department of Public Safety, United States District Court for the Southern District of Texas Corpus Christi Division, Civ. No. 2:13-cv-00263, June 27, 2014.

"Rebuttal Expert Report of Coleman Bazelon, Ph.D.," In the Matter of the *Companies' Creditors Arrangement Act, R.S.C. 1985, c. C-36, As Amended, and in the Matter of a Plan of Compromise or Arrangement of Nortel Networks Corporation, Nortel Networks Limited, Nortel Networks Global Corporation, Nortel Networks International Corporation and Nortel Networks Technology Corporation*, United States Bankruptcy Court for the District of Delaware, Case No. 09-10138 (KG), February 28, 2014.

"Supplemental Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *Sky Angel U.S., LLC, against Discovery Communications, LLC, Animal Planet, LLC*, United States District Court for the District of Maryland, Case No. 8:13-cv-00031-DKC, January 31, 2014.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of the *Companies' Creditors Arrangement Act, R.S.C. 1985, c. C-36, As Amended, and in the Matter of a Plan of Compromise or Arrangement of Nortel Networks Corporation, Nortel Networks Limited, Nortel Networks Global Corporation, Nortel Networks International Corporation and Nortel Networks Technology Corporation*, United States Bankruptcy Court for the District of Delaware, Case No. 09-10138 (KG), January 24, 2014.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *Sky Angel U.S., LLC, against Discovery Communications, LLC, Animal Planet, LLC,* United States District Court for the District of Maryland, Case No. 8:13-cv-00031-DKC, December 6, 2013.

"Expert Report of Coleman Bazelon, Ph.D. and Armando Levy, Ph.D.," In the Matter of *LT Game International Ltd., against Shuffle Master, Inc.*, United States District Court for the District of Nevada, Case No. 2:12-cv-01216-JAD-GWF, October 4, 2013.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of *Certain Electronic Devices, Including Wireless Communications Devices, Tablet Computers, Media Players, and Televisions, and Components Thereof, United States International Trade Commission*, Investigation No. 337-TA-862 (Judge Shaw), July 5, 2013.

"Declaration of Coleman Bazelon" In the Matter of *PTA-FLA, Inc., Daredevil, Inc., NTCH-WEST TENN., Inc., NTCH-WA, Inc.*, and *Eric Steinmann against ZTE Corporation, and ZTE USA, Inc. Florida Arbitration*, Case No.: 50-494-T-00665-11, February 26, 2013.

"Rebuttal Testimony of Coleman Bazelon," In re: *Petition for Suspension or Modification of Application of the Requirements of 47 U.S.C. § 251(b) and (c), pursuant to 47 U.S.C. § 251(f)(2) regarding Time Warner Cable Information Services (Maine) LLC's Request*, State of Maine Public Utilities Commission, Docket No. 2012-198, Docket No. 2012-218, Docket No. 2012-219, Docket No. 2012-220, Docket No. 2012-221, October 12, 2012.

"Testimony of Coleman Bazelon, Ph.D.," In re: *Petition for Suspension or Modification of Application of the Requirements of 47 U.S.C. § 251(b) and (c), pursuant to 47 U.S.C. § 251(f)(2) regarding Time Warner Cable Information Services (Maine) LLC's Request*, State of Maine Public Utilities Commission, Docket No. 2012-198, Docket No. 2012-218, Docket No. 2012-219, Docket No. 2012-220, Docket No. 2012-221, August 20, 2012.

"Expert Report of Dr. Coleman Bazelon," *Salsgiver Communications, Inc., Salsgiver Telecom, Inc., and Salsgiver Inc. v. Consolidated Communications Holdings, Inc., North Pittsburgh Systems, Inc., and North Pittsburgh Telephone Company, Inc.,* Court of Common Pleas, Allegheny County, Pennsylvania, Civil Division, No. GD 08-7616, May 10, 2012.

"Effect of the Proposed Merger on Service Quality, Consumer Services, Employment, and California's Economy," *Panelist on behalf of AT&T before the Public Utilities Commission of the State of California, Order Instituting Investigation on the Commissioner's Own Motion into the Planned Purchase and Acquisition by AT&T Inc. of T-Mobile USA, Inc., and Its Effect on California Ratepayers and the California Economy*. Case No. I.11-06-009, July 22, 2011.

"*Oral Testimony of Coleman Bazelon, The Brattle Group, Inc. before the U.S. House of Representatives, Committee on Energy and Commerce Subcommittee on Communication and Technology,*" April 12, 2011. (Spectrum)

"*Testimony of Coleman Bazelon, Principal, The Brattle Group, before the U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Communications, Technology, and the Internet,*" June 17, 2010 (spectrum valuation).

"Supplemental Expert Report of Coleman Bazelon," *Gemalto PTE LTD and Gemplus S.A. v. Telecommunications Industry Association*, United States District Court for the Eastern District of Virginia, Alexandria Division, Case 1:08-cv-00776-LMB-TRJ, December 16, 2008.

"Expert Report of Coleman Bazelon," *Gemalto PTE LTD and Gemplus S.A. v. Telecommunications Industry Association*, United States District Court for the Eastern District of Virginia, Alexandria Division, Case 1:08-cv-00776-LMB-TRJ, November 6, 2008.

"Prefiled Rebuttal Testimony of Coleman D. Bazelon," In re: *Complaint and Request for Emergency Relief Against Verizon Florida LLC for anticompetitive behavior in violation of Sections 364.01(4), 364.3381, and 364.10, F.S., and for failure to facilitate transfer of customers' numbers to Bright House Networks Information Services (Florida) LLC, and its affiliate, Bright House Networks, LLC*, Florida Public Service Commission, Docket No. 070691-TP, July 25, 2008.

"Prefiled Direct Testimony of Coleman D. Bazelon," In re: *Complaint and Request for Emergency Relief Against Verizon Florida LLC for anticompetitive behavior in violation of Sections 364.01(4), 364.3381, and 364.10, F.S., and for failure to facilitate transfer of customers' numbers to Bright House Networks Information Services (Florida) LLC, and its affiliate, Bright House Networks, LLC*, Florida Public Service Commission, Docket No. 070691-TP, May 30, 2008.

"Declaration of Coleman Bazelon in Support of Plaintiffs' Motion for Class Certification," *Kenneth Stickrath, et al v. Globalstar, Inc.*, United States District Court for the Northern District of California, San Francisco Division, Case No. 07-CV-01941 TEH, April 25, 2008.

"*Testimony of Coleman Bazelon, Principal, The Brattle Group, before the U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Telecommunications and the Internet*," April 15, 2008 (reviewing the 700 MHz auction).

"Concerning the Meaning of 'Fair and Reasonable Compensation' in Section 253(c) of the Telecommunications Act of 1996 and the Comparability of the Rights-of-Way Fees Paid by Level 3 in Massachusetts and Elsewhere," *The Massachusetts Turnpike Authority v. Level 3 Communications, LLC, et al.,* The United States District Court for the District of Massachusetts, Civ. Act. No. 06-11816, December 17, 2007.

"Concerning the Effects of the Fixed Rent Charged for Access to the Massachusetts Turnpike," *The Massachusetts Turnpike Authority v. Level 3 Communications, LLC, et al.,* The United States District Court for the District of Massachusetts, Civ. Act. No. 06-11816, November 12, 2007.

"Affidavit of Dr. Coleman Bazelon," *Gulfside Casino Partnership v. Mississippi Riverboat Council, et al.*, United States District Court for the Southern District of Mississippi, Southern Division, Case No. 1:07-CV-110-LG-JMR, May 4, 2007.

"Rebuttal Report of Dr. Coleman Bazelon," *Level 3 Communications, LLC, v. City of St. Louis, Missouri*, United States District Court for the Eastern District of Missouri, Eastern Division, Consolidated Case No. 4:04-CV-871 CAS, June 17, 2005.

"Affidavit of Dr. Coleman Bazelon," *Informed Communications Systems, Inc. v. Intelogistics Corp., d/b/a Prosodie Interactive*, United States District Court, Southern District of Florida, Miami Division, Case No.: 04-61245 CIV Huck/Turnoff, October 12, 2004.

EXPERT DESIGNATIONS

- *In the Matter of Certain Routers, Access Points, Controllers, Network Management Devices, Other Networking Products, and Hardware and Software Components Thereof*, United States International Trade Commission, Investigation No. 337-TA-1227 (Judge David P. Shaw)
    - Rebuttal Report (June 2, 2021)
    - Deposition (June 9, 2021)
    - Testified (July 29, 2021)
- *In the Matter of Certain Automated Storage and Retrieval Systems, Robots, and Components Thereof*, United States International Trade Commission, Investigation No. 337-TA-1228 (Chief Judge Charles E. Bullock)
    - Rebuttal Report (May 24, 2021)
    - Deposition (June 4, 2021)
    - Testified (August 6, 2021)
- *United States of America v. Daryl Bank, et al., Defendants*, United States District Court for the Eastern District of Virginia, Criminal Case No. 2:17-CR-126
    - Report (March 16, 2021)
    - Testified (April 14, 2021)
- *Schraft's 2.0, LLC, Claimant v. Progyny, Inc., Respondent*, AAA Case No. 01-19-0000-1248
    - Report (April 20, 2020)
    - Deposition (June 8, 2020)
    - Testified (August 23, 2020)
- *Rovi Guides, Inc. and TiVo Solutions, Inc. v. BCE Inc., Bell Aliant Regional Communications Inc., Bell Canada, Bell MTS Inc. and NorthernTel L.P. and Rovi Guides, Inc. and TiVo Solutions, Inc. v. Telus Communications Company, Telus Communications Inc. and Telus Corporation*, Federal Court of Canada, Court File Nos. T-113-18 and T-206-18
    - Report (January 29, 2020)
    - Reply Report (May 12, 2020)
    - Affidavit (June 12, 2020)
    - Revised Reply Report (June 26, 2020)

- Testified (July 22, 2020)

- *Rovi Guides, Inc. and TiVo Solutions Inc. v. Videotron Ltd.*, Federal Court of Canada, Court File No. T-921-17
  - Report (November 11, 2019)
  - Updated Report (January 10, 2020)
  - Reply Report (February 21, 2020)
  - Testified (May 27-28, 2020)
- *In the Matter of Kellie Pearson and The Law Offices of Mark Booker, on behalf of themselves and those similarly situated, v. Thomas M. Hodgson, In His Official Capacity as Sheriff Of Bristol County and Securus Technologies, Inc.*, United States District Court, District of Massachusetts, Case No. 1:18-cv-11130
  - Declaration (November 7, 2019)
- *In the Matter of Vertical Ventures II, LLC, et al., v. Smartcomm LLC, et al., and Smartcomm License Services, LLC, et al., v. Carla Marshall, an individual*, Superior Court of Arizona County of Maricopa, No. CV2015-009078.
  - Declaration (December 6, 2018)
- *In the matter of Premera Blue Cross Customer Data Security Breach Litigation*, United States District Court For the Region of Oregon, Case No. 3:15-md-2633-SI.
  - Declaration (August 3, 2018)
  - Deposition (September 10, 2018)
- *In the Matter of Certain Solid State Storage Drives, Stacked Electronics Components, and Products Containing Same*, United States International Trade Commission, Investigation No. 337-TA-1097 (Judge Dee Lord)
  - Deposition (March 2, 2018)
  - Testified (March 22, 2018)
- *In the Matter of ATK Space Systems, Inc., et al., vs. U.S. Space LLC*, Circuit Court of Loudon County, Virginia, Case No. CL-101847
  - Expert Report (September 8, 2017)
  - Rebuttal Report (October 20, 2017)
  - Second Rebuttal Report (November 10, 2017)
  - Deposition (December 7, 2017)
  - Testified (February 16, 2018)

- *In the Matter of Vertical Ventures II, LLC; Vertical Ventures V, LLC; LWH Network, LLC; L, W & C Network, LLC; and Spectrum Family 800, GP vs. Smartcomm, LLC; Smartcomm License Services, LLC; Smartcomm Management, LLC; Smartcomm Acquisitions, LLC; License Acquisitions, LLC; Big Wave Ventures, LLC; Spectrum Networks Group, LLC; M2M Spectrum Networks, LLC; Spectrum Acquisitions Group, LLC; Carlson Investment Group, LLC; Carole L. Downs; Barclay Knapp; and Joe Doe Transferees*, Superior Court of Arizona Maricopa County
    - Expert Report (March 24, 2017)
- *In the Matter of CC/Devas (Mauritius) Ltd., Devas Employees Mauritius Private Limited, and Telcom Devas Mauritius Limited*, Case No. PCA2013-09
    - Expert Report (January 16, 2017)
    - Second Expert Report (July 31, 2017)
    - Third Expert Report (November 29, 2017)
    - Fourth Expert Report (April 26, 2018)
    - Testified (July 19-20, 2018)
- *In the Matter of Certain Beverage Brewing Capsules, Components Thereof, and Products Containing the Same*, United States International Trade Commission, Washington, DC, Investigation No. 337-TA-929 (Judge Theodore Essex)
    - Expert Enforcement Proceeding Report (November 2, 2016)
    - Deposition (November 18, 2016)
    - Testified (January 11, 2017)
- *In the Matter of Commonwealth of Virginia, ex rel. State Corporation Commission v. Daryl Gene Bank and Raeann Ann Gibson*, Commonwealth of Virginia State Corporation Commission Hearing Examiner, Case No. SEC-2015-00020
    - Expert Report (November 4, 2016)
- *In the Matter of Securities and Exchange Commission v. Janus Spectrum LLC; David Alcorn; David Alcorn Professional Corporation; Kent Maerki; Dominion Private Client Group, LLC; Janus Spectrum Group, LLC; Spectrum Management, LLC; Spectrum 100, LLC; Prime Spectrum, LLC; Prime Spectrum Management, LLC; Daryl G. Bank; Premier Spectrum Group, PMA; Bobby D. Jones; Innovative Group, PMA; Premier Group, PMA; Prosperity Group, PMA; Terry W. Johnson; and Raymon G. Chadwick, Jr.*, United States District Court, District of Arizona, Docket No. CV- 15-609-PHX-SMM
    - Expert Report (May 13, 2016)
    - Deposition (August 12, 2016)
    - Declaration (October 6, 2016)

- *In the Matter of ACP Master, Ltd., Aurelius Capital Mater, Ltd., and Aurelius Opportunities Fund II, LLC, v. Sprint Corporation, Sprint Communications, Inc., Erik Prusch, John W. Stanton, William R. Blessing, Bruce A. Chatterley, Mufit Cinali, Jose A. Collazo, Hossein Eslambolchi, Dennis S. Hersch, Brian P. McAndrews, Kathleen H. Rae, Theodore H. Schell, Jennifer L. Vogel, Slade Gorton, Starburst I, Inc., and Softbank Corp., Court of Chancery, State of Delaware, C.A. No. 8508-VCL and ACP Master, Ltd., Aurelius Capital Mater, Ltd., and Aurelius Opportunities Fund II, LLC, v. Clearwire Corporation*, Court of Chancery, State of Delaware, C.A. No. 9042-VCL
    - Expert Report (September 25, 2015)
    - Rebuttal Report (October 23, 2015)
    - Amended Expert Report (November 2, 2015)
    - Deposition (November 10, 2015)
    - Testified (November 14, 2016)
- *In the Matter of Certain Footwear Products*, United States International Trade Commission, Washington, DC, Investigation No. 337-TA-936 (Judge Bullock)
    - Designated as an expert (March 6, 2015)
- *In the Matter of Certain Non-Volatile Memory Chips and Products Containing the Same*, United States International Trade Commission, Washington, DC, Investigation No. 337 TA-922 (Judge Pender)
    - Designated as an expert (December 19, 2014)
- *In the Matter of Certain Non-Volatile Memory Chips and Products Containing the Same*, United States International Trade Commission, Washington, D.C., Investigation No. 337 TA-916 (Judge Lord and Judge Essex)
    - Expert Report on Public Interest (November 24, 2014)
    - Expert Rebuttal Report on Domestic Industry (December 15, 2014)
    - Expert Report on Remedy and Bonding (December 15, 2014)
    - Deposition (January 9, 2015)
- *Wynnchurch Capital Ltd.*, In the Court of Chancery of the State of Delaware, C.A. No. 10077-VCL
    - Expert Report (November 7, 2014)
    - Deposition (November 17, 2014)
- *In the Matter of Certain Wireless Devices, Including Mobile Phones And Tablets II*, United States International Trade Commission, Investigation No. 337-TA-905 (Judge Pender)
    - Designated as an expert (April 16, 2014)
- *State of Texas v. Eric H. Holder, Jr., in his Official Capacity as Attorney General of the United States*, United States District Court for the District of Columbia, Case No. 1:12-CV-00128
    - Expert Report (June 27, 2014)

  - Reply Report (August 15, 2014)
  - Deposition (August 20, 2014)
  - Testified (September 9, 2014)
  - Third Amended Reply Report (September 22, 2014)

- *In the Matter of the Companies' Creditors Arrangement Act, R.S.C. 1985, c. C-36, As Amended, and in the Matter of a Plan of Compromise or Arrangement of Nortel Networks Corporation, Nortel Networks Limited, Nortel Networks Global Corporation, Nortel Networks International Corporation and Nortel Networks Technology Corporation*, United States Bankruptcy Court for the District of Delaware, Case No. 09-10138 (KG)
  - Expert Report (January 24, 2014)
  - Rebuttal Expert Report (February 28, 2014)
  - Deposition (April 3, 2014; May 30, 2014)
  - Testified (June 2, 2014; June 5, 2014)
- *In the Matter of Sky Angel U.S., LLC, against Discovery Communications, LLC, Animal Planet, LLC*, United States District Court for the District of Maryland, Case No. 8:13-cv-00031-DKC
  - Expert Report (December 6, 2013)
  - Supplemental Report (January 31, 2014)
  - Deposition (February 14, 2014)
  - Testified (November 23, 2015)
- *In the matter of LT Game International Ltd., against Shuffle Master, Inc.*, United States District Court for the District of Nevada, Case No. 2:12-cv-01216-JAD-GWF
  - Expert Report (October 4, 2013)
  - Deposition (November 12, 2013)
- *In the Matter of Certain Electronic Devices, Including Wireless Communications Devices, Tablet Computers, Media Players, and Televisions, and Components Thereof*, United States International Trade Commission, Investigation No. 337-TA-862 (Judge Shaw)
  - Rebuttal Patent Infringement Testimony (July 5, 2013)
- *In the Matter of PTA-FLA, Inc., Daredevil, Inc., NTCH-WEST TENN., Inc., NTCH-WA, Inc., and Eric Steinmann against ZTE Corporation, and ZTE USA, Inc. Florida Arbitration*, Case No.: 50-494-T-00665-11
  - Expert Report (February 26, 2013)
  - Deposition (March 15, 2013)
  - Testified (August 30, 2013)

- *In re Petition for Suspension or Modification of Application of the Requirements of 47 U.S.C. § 251(b) and (c), pursuant to 47 U.S.C. § 251(f)(2) regarding Time Warner Cable Information Services (Maine) LLC's Request*, State of Maine Public Utilities Commission, Docket No. 2012-198, Docket No. 2012-218, Docket No. 2012-219, Docket No. 2012-220, Docket No. 2012-221
    - Direct Testimony (August 20, 2012)
    - Rebuttal Testimony (October 12, 2012)
    - Testified (October 23, 2012)
- *In the Matter of Certain Products Containing Interactive Program Guide and Parental Control Technology*, United States International Trade Commission, Investigation No. 337-TA-820 (Judge Bullock)
    - Designated as an expert (June 8, 2012)
- *Salsgiver Communications, Inc., Salsgiver Telecom, Inc., and Salsgiver Inc. v. Consolidated Communications Holdings, Inc., North Pittsburgh Systems, Inc., and North Pittsburgh Telephone Company, Inc.*, Court of Common Pleas, Allegheny County, Pennsylvania, Civil Division, No. GD 08-7616
    - Damages Analysis (February 27, 2009)
    - Deposition (April 3, 2012)
    - Expert Report (May 10, 2012)
    - Testified (May 6, 2015; May 12, 2015)

- *Gemalto PTE LTD and Gemplus S.A. v. Telecommunications Industry Association,* United States District Court for the Eastern District of Virginia, Alexandria Division, Case 1:08-cv-00776- LMB-TRJ
    - Expert Report (November 6, 2008)
    - Deposition (December 2, 2008)
    - Supplemental Expert Report (December 16, 2008)
- *In re Complaint and request for emergency relief against Verizon Florida LLC for anticompetitive behavior in violation of Sections 364.01(4), 364.3381, and 364.10, F.S., and for failure to facilitate transfer of customers' numbers to Bright House Networks Information Services (Florida) LLC, and its affiliate*, Bright House Networks, LLC, Florida Public Service Commission, Docket No. 070691-TP
    - Direct Testimony (May 30, 2008)
    - Rebuttal Testimony (July 25, 2008)
    - Deposition (August 13, 2008)
- *Kenneth Stickrath, et al v. Globalstar, Inc.,* United States District Court for the Northern District of California, San Francisco Division, Case No. 07-CV-01941 THE
    - Declaration (April 25, 2008)
    - Deposition (June 11, 2008)

- *The Massachusetts Turnpike Authority v. Level 3 Communications, LLC, et al.,* The United States District Court for the District of Massachusetts, Civ. Act. No. 06-11816
    - Expert Report (November 12, 2007)
    - Rebuttal Report (December 17, 2007)
    - Deposition (January 21, 2008)
- *American Towers, Inc. v. Jackson & Campbell, P.C., et al.*, DC Superior Court, No. 003277-06
    - Deposition (March 19, 2009)
    - Affidavit (May 22, 2009)
- *Motorola, Inc. v. State of Mississippi Department of Information Technology Services and M/ACom, Inc.*, Chancery Court of Hinds County, Mississippi, Case No. G2006-2179 S/2
    - Testified (May 23, 2007)
- *Gulfside Casino Partnership v. Mississippi Riverboat Council, et al*., United States District Court for the Southern District of Mississippi, Southern Division, Cause No. 1:07-CV-110-LG-JMR
    - Affidavit (May 4, 2007)
- Cable Merger before the FTC
    - Presented analysis to FTC staff (March 20, 2007)
- *Level 3 Communications, LLC v. City of St. Louis, Missouri*, United States District Court for the Eastern District of Missouri, Eastern Division, Consolidated Case No. 4:04-CV-871 CAS
    - Rebuttal Report (June 17, 2005)
    - Deposition (July 14, 2005)
- *Informed Communications Systems, Inc. v. Intelogistics Corp., d/b/a Prosodie Interactive*, United States District Court, Southern District of Florida, Miami Division, Case No.: 04-61245 CIV Huck/Turnoff
    - Affidavit (October 12, 2004)
- *Touch America, Inc. v. Qwest Communications International, Inc.*
    - Designated as an expert in Arbitration (June 2003)

PUBLICATIONS

Articles and Book Chapters

Coleman Bazelon and Giulia McHenry, "Spectrum Value," *Telecommunications Policy*, Volume 37, issue 9, October 2013, pp. 737-747.

John Jarosz, Robin Heider, Coleman Bazelon, Christine Bieri, and Peter Hess, "Patent Auctions: How Far Have We Come?" *les Nouvelles*, March 2010, pp. 11-30.

"Too Many Goals: Problems with the 700 MHz Auction," *Information Economics and Policy*, June 2009, pp. 115-127.

"Licensed or Unlicensed: The Economic Considerations in Incremental Spectrum Allocations," *IEEE Communications Magazine*, March 2009, pp. 110-116.

Michael H. Rothkopf and Coleman Bazelon, "Interlicense Competition: Spectrum Deregulation Without Confiscation or Giveaways," OBTAINING THE BEST FROM REGULATION AND COMPETITION, Michael A. Crew and Menahem Spiegel, eds., Kluwer Academic Publishers (2005), pp. 135-159.

"Next Generation Frequency Coordinator," *Telecommunications Policy* 27 (2003), pp. 517-525.

Coleman Bazelon and Kent Smetters, "Discounting in the Long Term," *Loyola of Los Angeles Law Review*, Vol. 35, Issue 1, November 2002.

Coleman Bazelon and Kent Smetters, "Discounting Inside the Washington DC Beltway," *Journal of Economic Perspectives*, Fall 1999.

"The Movement of Markets," *Wesleyan Economic Journal*, Spring 1986.

"Is the Psychogenic Theory of History Scientific?" *Journal of Psychohistory*, Fall 1985.

White Papers, Reports, Studies, and Reviews

Coleman Bazelon and Paroma Sanyal, "Understanding Broadband Deployment: A Case Study of Los Angeles County," Public Utilities Commission of the State of California, Rulemaking 20-09-001, July 2, 2021.

Coleman Bazelon and Paroma Sanyal, "Captive Audiences: A Case Study of Phone Rates for Incarcerated Persons," Consumer Policy International, April 26, 2021.

Coleman Bazelon, Paroma Sanyal, Jonathan Lee, Ezra Frankel, and Ryan Taylor, "Network Value Drivers in a 5G World," Telecommunications Policy Research Conference 48, February 17, 2021.

Coleman Bazelon and Paroma Sanyal, "Spectrum Assignment for Advanced Mobile Broadband Services," Policy/Consultation Paper for the Afghanistan Telecommunications Regulatory Authority (ATRA), Selected Chapters on Auctions, September 2019.

Coleman Bazelon and Paroma Sanyal, "Mobile Broadband Spectrum: A Revaluation in a 5G World," Prepared for CTIA, May 29, 2019.

Coleman Bazelon, Renee Duplantis, and Agustin Ros, "Analysis of BDU Contributions, ISP Taxes and Regulations in the Canadian Broadcasting & Telecommunications Industries: Economic Efficiency, Investment and Innovation," Shaw Communications, January 11, 2019

Coleman Bazelon, Renee Duplantis, and Agustin Ros, "An Analysis of Broadband Services in Canada," Shaw Communications, August 30, 2018

Coleman Bazelon, "The Next Wave of Spectrum Reallocation: The Value of Additional Mid-Band Spectrum Reallocations," CTIA, November 14, 2017.

Coleman Bazelon and Pallavi Seth, "REIT Supported Wireless Infrastructure: Foundation of the Mobile Economy," The Wireless Infrastructure Association, May 23, 2017.

Coleman Bazelon and Lucrezio Figurelli, "The Economic Costs and Benefits of a Federal mandate that All Light Vehicles Employ 5.9 GHz DSRC Technology," National Cable & Telecommunications Association, May 2, 2016.

David Sunding, Martha Rogers, and Coleman Bazelon, "The Farmer and the Data: How Wireless Technology is Transforming Water Use in Agriculture," CTIA Wireless Foundation, April 22, 2016.

Coleman Bazelon, Nicol E. Turner-Lee, Olga Ukhaneva, and DeVan Hankerson, "A Lifeline to High-Speed Internet Access: An Economic Analysis of Administrative Costs and the Impact on Consumers," Multicultural Media, Telecom and Internet Council, March 2016.

Coleman Bazelon, Pallavi Seth, Steven Herscovici, Mark Berkman, Allen Sanderson, Brad Humphreys, Joseph Floyd, and Michael Abasciano, "Analysis of the Boston 2024 Proposed Summer Olympic Plans," Prepared for the Commonwealth of Massachusetts Office of the Governor, President of the Senate, and Speaker of the House, August 17, 2015.

Coleman Bazelon and Giulia McHenry, "Substantial Licensed Spectrum Deficit (2015-2019): Updating the FCC's Mobile Data Demand Projections," Prepared for CTIA – The Wireless Association, June 23, 2015.

Coleman Bazelon and Giulia McHenry, "Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy," Prepared for CTIA – The Wireless Association, May 11, 2015.

Kevin Hearle, Giulia McHenry, James Reitzes, Jeremy Verlinda, and Coleman Bazelon, "Vertical Foreclosure in Canadian Wholesale Services Markets," Supplemental Filing, Prepared for the Canadian Competition Bureau, August 18, 2014.

Kevin Hearle, Giulia McHenry, James Reitzes, Jeremy Verlinda, and Coleman Bazelon, "Canadian Wireless Market Performance and the Potential Effect of an Additional Nationwide Carrier," Prepared for the Canadian Competition Bureau, May 12, 2014.

Coleman Bazelon and Giulia McHenry, "Spectrum Sharing: Taxonomy and Economics," Office of Science and Technology Policy, filed comment March 18, 2014.

Coleman Bazelon and Giulia McHenry, "Spectrum Sharing: Taxonomy and Economics," sponsored by Verizon, February 6, 2014.

Coleman Bazelon and Giulia McHenry, "The Economics of Spectrum Sharing," Telecommunications Policy Research Conference, 2013.

Coleman Bazelon and Giulia McHenry, "Violating Your Privacy: An Economic Perspective," Telecommunications Policy Research Conference, September 24, 2013.

Coleman Bazelon and Giulia McHenry, "The Economics of Spectrum Sharing," *Global Media and Communications Quarterly*, Hogan Lovells, Autumn 2013, pp. 47-51.

Robert Shapiro, Douglas Holtz-Eakin, and Coleman Bazelon, "The Economic Implications of Restricting Spectrum Purchases in the Incentive Auctions," Georgetown University Center for Business & Public Policy, April 2013.

Lisa Cameron and Coleman Bazelon, “The Impact of Digitization on Business Models in Copyright-Driven Industries: A Review of the Economic Issues,” National Research Council (NRC) Committee on the Impact of Copyright Policy on Innovation in the Digital Era, February 26, 2013.

Robert A. Rogowsky, Pallavi Seth, and Coleman D. Bazelon, "An Economic View of ITC 337 Cases and the Public Interest," *Law360*, November 21, 2012.

Coleman Bazelon and Giulia McHenry, “Spectrum Value,” Telecommunications Policy Research Conference, 2012.

Robert A. Rogowsky, Pallavi Seth, and Coleman D. Bazelon, "An Economic View of the ITC's Domestic Industry," *Law360*, June 18, 2012.

Coleman Bazelon and Greg Duncan, “The Status of UNE-L in the United States,” Prepared for the Commerce Commission of New Zealand, April 12, 2012.

“Implications of Regulatory Inefficiency for Innovative Wireless Investments,” Sponsored by LightSquared, March 15, 2012.

Coleman Bazelon, Kevin Neels, and Pallavi Seth, “Beyond the Casino Floor: Economic Impacts of the Commercial Casino Industry,” sponsored by the American Gaming Association, 2012.

Coleman Bazelon, Charles Jackson, and Giulia McHenry, “An Engineering and Economic Analysis of the Prospects of Reallocating Radio Spectrum from the Broadcast Band through the Use of Voluntary Incentive Auctions,” Telecommunications Policy Research Conference, 2011.

“Cost of Regulatory Risk for Wireless Spectrum Values,” sponsored by LightSquared, August 23, 2011.

“Expected Receipts from Proposed Spectrum Auctions,” sponsored by the Wireless Broadband Coalition, July 28, 2011.

“GPS Interference: Implicit Subsidy to the GPS Industry and Cost to LightSquared of Accommodation,” sponsored by LightSquared, June 22, 2011.

Lisa Cameron and Coleman Bazelon, “The Impact of Digitization on Business Models in Copyright-Driven Industries: A Review of the Economic Issues,” National Research Council (NRC) Committee on the Impact of Copyright Policy on Innovation in the Digital Era, June 7, 2011.

“The Economic Basis of Spectrum Value: Pairing AWS-3 with the 1755 MHz Band is More Valuable than Pairing it with Frequencies from the 1690 MHz Band,” sponsored by T-Mobile and CTIA, April 11, 2011.

“Economists Letter to Obama Regarding Incentive Auctions,” April 6, 2011.

“The Indian 3G and BWA Auctions,” Telecommunications Policy Research Conference, 2010.

“Economic Impact of the Dutch Gas Hub Strategy on the Netherlands,” by Dan Harris, Coleman D. Bazelon, Brad Humphreys, and Penelope Dickson, *Netherlands Ministry of Economic Affairs, Agriculture and Innovation*, September 2010.

"The Employment and Economic Impacts of Network Neutrality Regulation: An Empirical Analysis," sponsored by Mobile Future, 2010.

"The Benefits of Wireless Broadband for Rural Deployments," sponsored by Qualcomm, Inc., 2010.

"Comments of 71 Concerned Economists – Using Procurement Auctions to Allocate Broadband Stimulus Grants," Submitted to the National Telecommunications Information Agency (NTIA) and Rural Utilities Service (RUS), April 13, 2009.

Malcolm K. Sparrow, Coleman Bazelon, and Charles Jackson, "Can Internet Gambling Be Effectively Regulated? Managing the Risks," sponsored by Wired Safety, 2009.

"The Need for Additional Spectrum for Wireless Broadband: The Economic Benefits and Costs of Reallocations," sponsored by Consumer Electronics Association, 2009.

Coleman Bazelon and William Zarakas, "Measuring Concentration in Radio Spectrum License Holdings," Telecommunications Policy Research Conference, 2009.

"Licensed or Unlicensed: The Economic Considerations in Incremental Spectrum Allocations," in *New Frontiers in Dynamic Spectrum Access Networks, 2008*, DySPAN 2008.

"Overreaching: The Policy Failures of the 700 MHz Auction," Telecommunications Policy Research Conference, 2008.

"Cream Skimming," Telecommunications Policy Research Conference, 2007.

Thomas W. Hazlett and Coleman Bazelon, "Market Allocation for Radio Spectrum," prepared for the International Telecommunications Union Workshop on Market Mechanisms for Spectrum Management, Geneva, Switzerland, January 2007.

"Licensed or Unlicensed: The Economics of Incremental Spectrum Allocations," Telecommunications Policy Research Conference, 2006.

"Analysis of an Accelerated Digital Television Transition," sponsored by Intel Corporation, 2005.

Thomas W. Hazlett and Coleman Bazelon, "Regulated Unbundling of Telecommunications Networks: A Stepping Stone to Facilities-Based Competition?" Telecommunications Policy Research Conference, 2005.

Thomas W. Hazlett, Coleman Bazelon, John Rutledge, and Deborah Allen Hewitt, "Sending the Right Signals: Promoting Competition Through Telecommunications Reform: A Report to the U.S. Chamber of Commerce," September 22, 2004.

Thomas W. Hazlett, Arthur M. Havenner, and Coleman Bazelon, "Regulation and Investment in Local Telecommunications Networks," Working Paper, January 2004.

Michael H. Rothkopf and Coleman Bazelon, "Interlicense Competition: Spectrum Deregulation Without Confiscation or Giveaways," New America Foundation, Spectrum Series Working Paper #8, August 2003.

"Review of Discounting and Intergenerational Equity," by Paul Portney and John Weyant, Resources for the Future (1999), in the Society of Government Economists Newsletter, Volume 34, No. 10, November 2002.

"Completing the Transition to Digital Television," Congressional Budget Office, September 1999.*

"Two Approaches for Increasing Spectrum Fees," Congressional Budget Office, November 1998 (Coauthored with David Moore*).

"Where Do We Go From Here? The FCC Auctions and the Future of Radio Spectrum Management," Congressional Budget Office, April 1997 (Coauthored with Perry Beider and David Moore*).

* CBO publications do not cite authors' names.

Federal Communications Commission Filings

"IP CTS Costs and Reimbursement Rates," with Brent Lutes, GC Docket Nos. 13-24, 03-123, July 30, 2021.

"Exclusive Use of Public Rights of Way, Unfair Competitive Practices, and Fair and Reasonable Compensation," with Paroma Sanyal, Section 253 Petition Filed by MCC Iowa, LLC, May 12, 2021.

"Valuing the 12 GHz Spectrum Band with Flexible Use Rights," with Paroma Sanyal, WT Docket No. 20-443, GN Docket No. 17-183, May 7, 2021.

"Further Comments on 'Rates for Interstate Inmate Calling Services,' Report and Order on Remand and Fourth Further Notice of Proposed Rulemaking," with Paroma Sanyal and Andrea Helfant, WC Docket No. 12-375, March 25, 2021.

Comments on "Rates for Interstate Inmate Calling Services," Report and Order on Remand and Fourth Further Notice of Proposed Rulemaking, with Paroma Sanyal and Andrea Helfant, WC Docket No. 12-375, November 23, 2020.

"IP CTS Costs and Reimbursement Rates," with Brent Lutes, CG Docket Nos. 13-24, 03-123, July 14, 2020.

"Benefits and Costs of Greater Connectedness," with Paroma Sanyal, IB Docket No. 11-109, 12-340, June 1, 2020.

"The Economics of Unlicensed and Dedicated Use Spectrum in the 5.9 GHz Band," with Paroma Sanyal, ET Docket No. 19-138, April 27, 2020.

"Value Creation from an Accelerated Clearing of the C-Band Spectrum," with Paroma Sanyal, WTB 18-122, January 16, 2020.

"Public Interest Benefits of Expanding Fiber Networks," WC Docket Nos. 19-126, WC Docket Nos. 10-90, WC Docket Nos. 19-195, October 21, 2019.

"Advancing 5G Deployment: Shared Flexible Use of the 1675 – 1680 MHz Band," WTB Docket Nos. 19-116, ETRN Docket Nos. 11-681, July 22, 2019

"Choosing an Appropriate Geographic Licensing Size," WTB Docket No. 19-116, ETRN Docket No. 11-681, June 21, 2019.

"Response to Israel, Katz, and Keating April 12, 2019 Declaration," Confidential, with Jeremy Verlinda and William Zarakas, Attachment A, WT Docket Nos. 18-197, May 1, 2019.

"Response to Compass Lexecon February 20, 2019 Declaration and Mark McDiarmid March 6, 2019 Declaration," Confidential, with Jeremy Verlinda and William Zarakas, Attachment A, WT Docket Nos. 18-197, March 28, 2019.

"Economic Considerations of IP CTS Rate Structure and Methodology," with Brent Lutes, CG Docket Nos. 13-24, 10-51, and 03-123, March 27, 2019.

"Response to Applicants' February 7 Filings on Diversion Ratios," Confidential, with Jeremy Verlinda and William Zarakas, Attachment A, WT Docket Nos. 18-197, March 25, 2019.

"Reply to Cornerstone's 'Response to Dish's February 19 and 25 Submissions,'" Confidential, with Jeremy Verlinda and William Zarakas, Attachment A, WT Docket Nos. 18-197, March 18, 2019.

"Reply to Cornerstone's 'Response to Dish and CWA Comments,'" Confidential, with Jeremy Verlinda and William Zarakas, Attachment A, WT Docket Nos. 18-197, February 19, 2019.

"Network Engineering Model's Sensitivity to Millimeter Wave Adjustments," Confidential, with Jeremy Verlinda and William Zarakas, Attachment A, WT Docket Nos. 18-197, February 4, 2019.

"Response to Applicant Filings on Diversion Ratios," Confidential, with Jeremy Verlinda and William Zarakas, Attachment A, WT Docket Nos. 18-197, January 28, 2019.

"Further Reply Declaration," Confidential, with Jeremy Verlinda and William Zarakas, WT Docket Nos. 18-197. December 4, 2018.

"Reply Declaration of Joseph Harrington, Coleman Bazelon, Jeremy Verlinda, and William Zarakas," Confidential, Exhibit 1, WT Docket Nos. 18-197, October 31, 2018.

"Comments on the FCC's NPRM to Transition C-Band Spectrum to Terrestrial Uses," Prepared by Coleman Bazelon, GN Docket No. 18-122, October 29, 2018.

"Declaration of Joseph Harrington, Coleman Bazelon, Jeremy Verlinda, and William Zarakas," Confidential, Exhibit B, WT Docket Nos. 18-197, August 27, 2018.

"Economic Analysis of Subcontractor Fees Paid by Hamilton Relay," Confidential, CG Docket Nos. 13-24, 03-123, November 10, 2017.

"Economic Analysis of IP CTS Provision Costs and Rate Setting," CG Docket Nos. 13-24, 03-123, November 8, 2017.

"Telecommunications Relay Services for Individuals who are Deaf or Hard of Hearing – Market and Policy Analyses," CG Docket Nos. 13-24, 03-123, August 30, 2017.

"Putting Mid-Band Spectrum to Work: Sharing between Ligado Networks and its GPS Neighbors," FCC IB Docket No. 11-109, May 23, 2016.

Erratum to the October 15, 2015 Ex Parte notice, "Rates for Interstate Inmate Calling Services," WC Docket No. 12-375, October 16, 2015.

"Memorandum in Response to Securus Filing," Ex Parte Written Presentation, Rates for Interstate Inmate Calling Services, WC Docket No. 12-375, August 28, 2015.

"Memorandum to provide an analysis of the Cost Study submissions by the ICS providers," Ex Parte Written Presentation, Rates for Interstate Inmate Calling Services, WC Docket No. 12-375, August 14, 2015.

"Unlicensed Operations in the 600 MHz Band: Fatally Flawed Twice Over," with Charles Jackson and Dorothy Robyn, ET Docket No. 14-165, GN Docket No. 12-268, February 25, 2015.

"Staying on Track: Realizing the Benefits from the FCC's Incentive Auction without Delay," with Giulia McHenry, Comments of LocusPoint Networks, LLC, Attachment A, AU Docket No. 14-252, GN Docket No. 12-268, February 20, 2015.

"Reply Declaration of Coleman Bazelon," Reply Comments of Martha Wright, Et Al., The D.C. Prisoners' Legal Services Project, Inc., and Citizens United for Rehabilitation of Errants, WC Docket No. 12-375, January 27, 2015.

"Reply Declaration of Coleman Bazelon," Comments of Martha Wright, et al., Exhibit A, WC Docket No. 12-375, April 22, 2013 (prison payphone rates).

"Declaration of Coleman Bazelon," Comments of Martha Wright, et al., Exhibit C, WC Docket No. 12-375, March 25, 2013 (prison payphone rates).

"Declaration of Coleman Bazelon," Verizon Telephone Companies and Verizon Services Corp., v. Madison Square Garden, L.P., and Cablevision Systems Corp., FCC Filling, File No. CSR-8185-P, October 22, 2010 (program access complaint).

"Unlicensed Use of the TV White Spaces: Wasteful and Harmful," FCC Filling, with Charles L. Jackson and Dorothy Robyn, *Ex Parte* Comments, ET Docket No. 04-186, ET Docket No. 02-380, August 20, 2008 (benefits of licensed over unlicensed allocation of the TV White Spaces).

"Comments of Charles L. Jackson, Dorothy Robyn and Coleman Bazelon," Comments, WC Docket No. 06-150, PS Docket No. 06-229, June 20, 2008 (value of TV White Spaces).

"Comments of Coleman Bazelon," Comments, WC Docket No. 06-150, PS Docket No. 06-229, WT Docket No. 96-86, June 20, 2008 (700 MHz D Block).

"Declaration of Coleman Bazelon," Reply Comments, WC Docket No. 07-245, April 22, 2008 (economics of pole attachment rates).

"Why the Exclusive Use of Large Licenses in the Upper or Lower 700 MHz Bands Would Reduce the Efficiency of the 700 MHz Auction," Comments, WT Docket No. 06-150, April 20, 2007.

"Principles for Choosing 700 MHz Block License Sizes," *Ex Parte* Comments, WT Docket No. 06-150, March 6, 2007.

"The Economics of License Sizes in the FCC's 700 MHz Band Auction," *Ex Parte* Comments, WT Docket No. 06-150, January 2007.

"Declaration of Thomas W. Hazlett, Ph.D., Prof. Arthur M. Havenner, and Coleman Bazelon, Ph.D.," Comments, WC Docket No. 03-173, December 16, 2003. (Wireline investment, UNE-P)

"Declaration of Thomas W. Hazlett, Ph.D., Arthur M. Havenner, Ph.D., and Coleman Bazelon, Ph.D.," Comments, WC Docket No. 03-157, September 2, 2003. (Wireline investment, UNE-P)

"Spectrum Deregulation Without Confiscation or Giveaways," with Michael Rothkopf, Comment, ET Docket No. 02-135, January 9, 2003.

Thomas W. Hazlett, Coleman Bazelon, and Arthur Havenner, "Forecast of Toll Free Number Demand: 2002-2004," Attachment A, SMS/800 Transmittal No. 22, F.C.C. Tariff No. 1, November 15, 2002.

"Comments of Coleman D. Bazelon and T. Christopher Borek Relating to Arthur D. Little, Inc.'s Assessment of the Impact of DTV on the Cost of Consumer Television Receivers," *Ex Parte* Comments MM Docket 00-39, August 1, 2002.

"Use Administrative Law Judges to Adjudicate Interference Disputes Between Licensees," Comment ET Docket No. 02-135, July 8, 2002.

SEMINARS AND PRESENTATIONS

5G Spectrum: Building Blocks Of Communications Infrastructure, Cowen and Company Communications Infrastructure Summit, Boulder, Colorado, August 10, 2021.

"How to Satisfy Domestic Industry Requirements: Addressing New Intricacies,"ACI's 13th Annual Practitioners' Think Tank on ITC Litigation and Enforcement, July 27, 2021.

"Evolving Public Interest Considerations in 337 Investigations and Litigation," ACI's ITC Litigation & Enforcement, August 25, 2020.

"CBO Scoring: A Window into the Blackbox: A Brief primer on how the congressional budget office scores auctions," FCBA Brownbag, March 6, 2020.

"CBO Scoring: A Window into the Blackbox: A Brief primer on how the congressional budget office scores auctions," CTIA Presentation, January 17, 2020.

A Fireside Chat with Coleman Bazelon, Cowen and Company Communications Infrastructure Summit, Boulder, Colorado, August 7, 2018.

C-Band: A Market-Driven Spectrum Proposal for 5G, Senator Visitors Center, Washington, DC, April 13, 2018.

Government Seizures of Property, Ferrum College Forum, Ferrum, Virginia, March 14, 2016.

The $100 Billion Question: Who Gets The Spectrum?, NAB Content and Communications World, New York, New York, November 11, 2015.

Spectrum versus Infrastructure: Complimentary Assets, Cowen and Company Communications Infrastructure Summit, Boulder, Colorado, August 12, 2015.

Moving Towards General Purpose Spectrum, Aspen Institute Roundtable on Spectrum Policy (AIRS), Queenstown, Maryland, October 22 – 24, 2014.

Winnik International Telecoms & Internet Forum: The Internet of Things, Washington, DC, October 22, 2014.

Spectrum Sharing: How Much Can It Contribute?, Technology Policy Institute Aspen Forum, Aspen, Colorado, August 18, 2014.

Internet Privacy, Civil Liberties, National Security, Law, and Economics: In Search of a Coherent Policy Path Forward, Ferrum College Forum, Ferrum, Virginia, March 19, 2014.

S*pectrum Auctions Are Back: What you need to know,* Bloomberg BNA Webinar, February 19, 2014.

Violating Your Privacy: An Economic Perspective, 41st Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 28, 2013.

Other Recent and Planned Spectrum Auctions: What They Portend for the Future: Economic Perspectives on the Auctions, Law Seminars International, Washington, DC, July 22, 2013.

Spectrum Auction Policy: Potential Outcomes for Economic Growth and Public Safety, Georgetown University McDonough School of Business, Rayburn House Office Building, Washington, DC, May 14, 2013.

Markets in Wireless Spectrum, Towards Dynamic Markets in Electric Power, Water, and Wireless Spectrum Seminar, University of Colorado Law School, Boulder, CO, April 23, 2013.

The Underwood Memorial Lecture and Hoggendorn lecture for the Economic Department, Wesleyan University, Middletown, CT, April 18, 2013.

Ethics and Intellectual Entrepreneurship, Annual College of Social Studies Spring Banquet keynote speaker, Wesleyan University, Middletown, CT, April 17, 2013.

Food-Water-Energy The Right Balance, Ferrum College Forum panel, Ferrum, Virginia, March 12, 2013.

FCC Incentive Auction Rules: Estimating Clearing Prices and Policy Impacts, SNL Knowledge Center Webinar, February 27, 2013.

Reverse Auction Design: Dynamic or Sealed, Algorithmic Issues, Market Power, Reserves, Reference Prices, Conference on the FCC Incentive Auction, Stanford Institute for Economic Policy Research, Stanford, CA, February 26, 2013.

Mobile Impact on Economic Growth and Job Creation, Consumer Electronics Show, LIT Program Innovation Policy Summit, Las Vegas, NV, January 8, 2013.

Incentive Auctions: What Broadcasters Need to Know, Crossfire Media Webinar, December 19, 2012.

Spectrum Value, 40th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 22, 2012.

FCBA Seminar: Getting from Here to There: The Road Ahead for Spectrum Auctions, Washington, DC, June 6, 2012.

Incentive Auctions, 39th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 24, 2011.

Competition in the Wireless Environment: How to Get More Handsets or More Networks, Broadband Breakfast Club, Washington, DC, February 15, 2011.

Introducing TV White Spaces, Spectrum Bridge webinar, October 28, 2010.

The Indian 3G and BWA Auctions, 38th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, October 2, 2010.

How Smart Public Policies Can Drive the Mobile Broadband Transformation, Information Technology and Innovation Foundation's The Emerging Mobile Broadband Economy and its New Business Models, Washington, DC, September 14, 2010.

Community Broadband-A Blessing or Curse?, K&L Gates LLP Municipal Broadband Webcast, July 29, 2010.

Towards A Sustainable Spectrum Policy: Rethinking Federal Spectrum, Public Knowledge, Washington, DC, June 3, 2010.

Unraveling Net Neutrality: Should the FCC Regulate Broadband, Independence Institute, Denver, CO, May 26, 2010.

CQ-Roll Call Policy Breakfast on the Future of Wireless Broadband, Washington, DC, May 20, 2010.

Congressional Staff Briefings on "The Need for Additional Spectrum for Wireless Broadband: The Economic Benefit and Costs of Reallocations," Washington, DC, December 8, 2009.

The Progress and Freedom Foundation's "Let's Make a Deal: Broadcasters, Mobile Broadband, and a Market in Spectrum," Washington, DC, December 1, 2009.

FCBA's Intellectual Property Practice Committee Brown Bag Lunch, Washington, DC, November 30, 2009.

Measuring Concentration in Radio Spectrum License Holdings, 37th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 26, 2009.

FCC Broadband Spectrum Workshop, Washington, DC, September 17, 2009.

Broadband Stimulus Plan, 2009 FLATOA-FCBA Conference, Tampa, FL, June 26, 2009.

Leveraging the Broadband Stimulus and Licensed Spectrum, Webinar, April 29, 2009.

Keynote Address, Enterprise Wireless08, Scottsdale, AZ, November 6, 2008.

Licensed or Unlicensed: The Economic Considerations in Incremental Spectrum Allocations, DySPAN, Chicago, IL, October 16, 2008.

Overreaching: The Policy Failures of the 700 MHz Auction, 36th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 27, 2008.

Cream Skimming, 35th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 29, 2007.

Auction Revenues are not the Only Revenues that Should Drive Spectrum Policy, Law Seminars International: Spectrum Management, Washington, DC, September 17, 2007.

Market Allocation for Radio Spectrum, International Telecommunications Union Workshop on Market Mechanisms for Spectrum Management, Geneva, Switzerland, January 2007.

Licensed vs. Unlicensed Spectrum: A New Economic Model for Determining the Trade-offs, 34th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 30, 2006.

Decoding the Future of IP-TV, Northern California Chapter of the Federal Communications Bar Association, San Francisco, February 2006.

Accelerating the Digital Television Transition, COMPTEL Executive Business & Policy Summit, Washington, DC, December 2005.

Regulated Unbundling of Telecommunications Networks: A Stepping Stone to Facilities Based Competition?, Telecommunications Policy Research Conference, Arlington, VA, September 2005.

Sending the Right Signals: Promoting Competition Through Telecommunications Reform: A Report to the U.S. Chamber of Commerce, presentation of report to the US Chamber of Commerce, October 6, 2004.

Telecommunications Reform, presentation to the US Chamber of Commerce's Technology Policy Committee, April 29, 2004.

Interlicense Competition, Telecommunications Policy Research Conference, Arlington, VA, September 2003.

Marketing & Legal Strategies: Hope, Hype & Crash Landings, WCAI 2003, Washington, DC, July 10, 2003.

Spectrum Policy Task Force Interference Recommendations, Manhattan Institute Conference, Washington, DC, February 13, 2003.

FCC License Auctions, Society of Government Economists Conference, Washington, DC, November 22, 2002.

Spectrum Management Panel, CTIA Wireless 2002, Orlando, FL, March 18, 2002.

A Note on Correlation, ASSA Annual Meetings, Atlanta, GA, January 6, 2002.

Regulatory Forbearance, Powerline Communications Conference, Washington, DC, December 13, 2001.

Spectrum License Valuations, CTIA Wireless Agenda 2001, Dallas, TX, May 2001.

Old Spectrum in the New Economy, with David Moore, invited paper, Society of Government Economists Conference, "The New 'Economy': What Has Changed and Challenges for Economic Policy," Washington, DC, November 2000.

Discounting Inside the Washington DC Beltway, Energy Information Agency Seminar Series, Washington, DC, March 2000.

Discounting Inside the Washington DC Beltway, Congressional Budget Office Seminar Series, Washington, DC, November 1999.

Completing the Transition to Digital Television, Telecommunications Policy Research Conference, Arlington, VA, September 1999.

Digital Television Transition, Congressional Budget Office Seminar Series, Washington, DC, April 1999.

The Budgetary Treatment of Asset Sales, briefing for the staff of the Senate Budget Committee, Washington, DC, February 1997.

The Value Added from Multilateral Bargaining Theory for Applied Research, with Greg Adams, Selected Paper, AAEA Annual Meeting, Baltimore, MD, August 1992.

The Importance of Political Markets in Formulating Economic Policy Recommendations, Selected Paper, AAEA Annual Meeting, Manhattan, KS, August 1991.

L.D.C. Debt and Policy Linkages in the Determination of World Commodity Prices, with Gordon Rausser, Selected Paper, AAEA Annual Meeting, Vancouver, BC, Canada, August 1990.

PROFESSIONAL EXPERIENCE

- **The Brattle Group (2007-Present)**
  Principal

- **Analysis Group (2001-2007)**
  Vice President

- **Congressional Budget Office (1995-2001)**
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REVIEWER

- American Journal of Agricultural Economics (1989 – 1994)
- Congressional Budget Office Reports
- Telecommunications Policy
- Telecommunications Policy Research Conference Program Committee (2011-2013)
- George Mason University
- Journal of Information Policy

PROFESSIONAL AFFILIATIONS

- American Bar Association
- American Economic Association
- Federal Communications Bar Association
- National Research Council – Committee on a Survey of the Active Scientific Use of the Radio Spectrum

EDUCATION

Dr. Bazelon received his PhD and MS in Agricultural and Resource Economics from the University of California at Berkeley. He also holds a Diploma in Economics from the London School of Economics and Political Science and a BA from Wesleyan University.

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Sources Considered

Investigative Testimony and Depositions

1. Deposition of Daryl Bank, June 11, 2014.
2. Deposition of David Alcorn, March 15, 2016.
3. Deposition of Kent Maerki, January 26, 2016.
4. Deposition of Kent Maerki, May 15, 2014.
5. Deposition of Robert Labine, April 8, 2016.
6. Deposition of Terry Johnson, April 20, 2016.
7. Testimony of Jack Forrest, June 26, 2014.
8. Testimony of Peter T. Lewis, April 7, 2016.

Exhibits

9. Audio transcription of "Educational Preview About Airwaves" and "Money from Thin Air," Exhibit 21.
10. Audio transcription of cellular presentation with Bobby Jones and Kent Maerki, Exhibit 30.
11. Audio transcription of WPSL Radio Show, Exhibit 23.
12. Bobby Jones webinar invitation, Exhibit 284, April 15, 2013.
13. "Conference Call Transcript," Exhibit 26, March 9, 2013.
14. Email between David Alcorn and Nathaniel Dodson (Mr. Alcorn's attorney), Exhibit 223, September 22, 2012.
15. Email between Peter Lewis and David Alcorn, Exhibit 434, March 16, 2015.
16. Email between Peter Moncure and David Alcorn, Exhibit 391, January 9, 2015.
17. Email from Alan Tilles to David Alcorn, Exhibit 458, August 2, 2014.
18. Email from Bob LaBine to Bobby Jones, Exhibit 292, August 12, 2014.

19. Email from Bobby Jones regarding commission, Exhibit 289, July 31, 2013.
20. Email from Bobby Jones to investors, Exhibit 285, July 23, 2013.
21. Email from David Alcorn to Bob Labine and others, Exhibit 326, October 17, 2011.
22. Email from David Alcorn to Daryl Bank, Exhibit 235, June 30, 2012.
23. Janus Workshop on Emerging Technologies for Connectivity & Communications, Washington D.C., Exhibit 319, June 24, 2014.
24. Email from David Alcorn to investor, Exhibit 335, July 24, 2010.
25. Email from David Alcorn to John Dillon, Exhibit 114, May 2, 2013.
26. Email from David Alcorn to Kent Maerki, Exhibit 219, November 5, 2012.
27. Email from David Alcorn to Kent Maerki, Exhibit 323, February 3, 2012.
28. Email from Kent Maerki to David Alcorn, Exhibit 315, November 24, 2010.
29. Email from Nathaniel Dodson to David Alcorn, Exhibit 327, February 1, 2012.
30. Email from Nathaniel Dodson to David Alcorn, Exhibit 330, February 14, 2012.
31. Email from Peter Moncure to David Alcorn, Exhibit 317, February 2, 2012.
32. Email from Peter Moncure to Tripp Forrest, Exhibit 386, December 4, 2012.
33. Email from Tina Ellis to David Alcorn, Exhibit 312, August 5, 20117.
34. Email from Tripp Forrest at Tusa Consulting to Peter Moncure and David Alcorn, Exhibit 385.
35. Excerpt from Janus website, Exhibit 228.
36. “Fair warning from Sprint: We can’t buy 800 MHz spectrum we just returned to the FCC,” Exhibit 318, October 21, 2014.
37. Janus Spectrum agreement with Dominion Investment Group, Exhibit 322, July 17, 2012.
38. “Janus Spectrum Application Services Agreement,” Exhibit 211.
39. Janus Spectrum Group Investment Offering, Exhibit 89, August 2012.

40. Janus Spectrum pro forma, Exhibit 113.
41. Letter to Expectrum Partners from Terry Johnson and Ray Chadwick, Exhibit 71.
42. "Member Independent Contractor Agreement," Exhibit 287, February 15, 2013.
43. Michael Wilhelm Declaration, Exhibit 311, July 17, 2014.
44. "Oakdale Capital LLC PPM Comments and Questions," Exhibit 217, February 29, 2012.
45. "PPM FAQ Janus Spectrum LLC," Exhibit 229.
46. Premier Spectrum Group Membership Fee Offering 2013, Exhibit 19.
47. "Pro Forma Assumptions and Explanations," Exhibit 331.
48. Pro forma for Rapidlink wireless, Exhibit 342, December 9, 2014.
49. RadioSoft invoice, Exhibit 392, February 10, 2015.
50. RapidLink Wireless Build Out Plan Overview, Exhibit 337, October 27, 2015.
51. RapidLink Wireless Status Report, Exhibit 352, July 10, 2015.

Expert Reports

52. Coleman Bazelon Expert Report SEC v. Janus Spectrum LLC, et al. (CV-15-609-PHX-SMM) ¶ 67.

Academic Papers

53. Coleman Bazelon and Giulia McHenry, "Spectrum Value," Telecommunications Policy (2013), volume 37, issue 9: 737- 747.
54. Coleman Bazelon, "Too Many Goals: Problems with the 700 MHz Auction," Information Economics and Policy 21 (2009).
55. Coleman Bazelon, Paroma Sanyal, Jonathan Lee, Ezra Frankel and Ryan Taylor, "Network Value Drivers in a 5G World," White Paper, The Brattle Group, TPRC 4, Revised February 12, 2021.
56. Gilbert Held, "Data Communications: Use the Right Medium for your Message," April 12, 2002, http://www.informit.com/articles/article.aspx?p=26321&seqNum=6.
57. Max Paglin, ed., The Communications Act: A Legislative History of the Major Amendments 1934-1996 (Maryland: Pike & Fischer, Inc., 1999)

58. National Academies of Sciences, Engineering, and Medicine. A Strategy for Active Remote Sensing Amid Increased Demand for Radio Spectrum; Spectrum Access: Allocation Policies and the Assignment Process, National Academies Press, 2015.

59. Thomas W. Hazlett, "Assigning property rights to radio spectrum users: Why did FCC license auctions take 67 years?," The Journal of Law and Economics 41.S2 (1998): 529-576.

Public Sources

60. "5G Spectrum," GSMA Public Policy Position, March 2020, https://www.gsma.com/spectrum/wp-content/uploads/2020/03/5G-Spectrum-Positions.pdf.

61. "800 MHz Band Reconfiguration Handbook" 800 MHz Transition Administrator, LLC, September 6, 2013, http://www.800ta.org/content/resources/Reconfiguration_Handbook.pdf.

62. "800 MHz Band Reconfiguration Program," 800 MHz Transition Administrator, LLC., http://www.800ta.org/_img/figures/img_channel_lrg.gif.

63. "800 MHz Cellular Service," FCC, https://www.fcc.gov/general/cellular-service.

64. "About Auctions," FCC, http://wireless.fcc.gov/auctions/default.htm?job=about_auctions&page=1

65. "Advanced Wireless Services (AWS)," FCC, https://www.fcc.gov/wireless/bureau-divisions/broadband-division/advanced-wireless-services-aws.

66. "Anatomy of an Electromagnetic Wave," NASA, https://science.nasa.gov/ems/02_anatomy.

67. "Auction 73, 700 MHz Band," FCC, http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=73.

68. Coleman Bazelon Declaration in Support of Plaintiff in *Securities and Exchange Commission v. Janus Spectrum LLC et al.* (2:15-CV-00609-SMM), dated October 6, 2016.

69. "Exploring the Value and Economic Valuation of Spectrum," ITU, April 2012, https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_SpectrumValue.pdf.

70. "Exploring the Value and Economic Valuation of Spectrum," ITU, April 2012, Section 3.1, https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_SpectrumValue.pdf.

71. "FCC 601 Main Form, FCC Application for Radio Service Authorization: Wireless Telecommunications Bureau Public Safety and Homeland Security Bureau," FCC, December 2020.

72. "FCC Establishes Competitive Bidding Procedures for December's C-Band Auction," FCC press release, August 6, 2020, https://docs.fcc.gov/public/attachments/DOC-366000A1.pdf.

73. "FCC Transforms 900 MHz Band to Enable Broadband Deployment by Utilities and Other Industries," FCC press release, May 13, 2020, https://docs.fcc.gov/public/attachments/DOC-364320A1.pdf.

74. "Fees," Forest Industries Telecommunications, http://fcclicense.org/fit/?page_id=73.

75. "Full Duplex," Voicent, https://www.voicent.com/glossary/full-duplex.php.

76. "In the Matter of Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems and Implementation of Section 309(j) of the Communications Act - Competitive Bidding," FTC, March 18, 1996, https://www.ftc.gov/sites/default/files/documents/advocacy_documents/comment-federal-communications-commission-matter-paging-licensing-rules/v960007.pdf

77. "Industrial / Business Licensing," Federal Communications Commission, at "Frequency Coordinators," September 26, 2019, https://www.fcc.gov/wireless/bureau-divisions/mobility-division/industrial-business/industrial-business-licensing.

78. "Industrial/Business Licensing," FCC, https://www.fcc.gov/wireless/bureau-divisions/mobility-division/industrial-business/industrial-business-licensing#:~:text=Frequency%20coordinators%20are%20FCC%20certified,a%20showing%20of%20frequency%20coordination.

79. "Industrial/Business" FCC, https://www.fcc.gov/wireless/bureau-divisions/mobility-division/industrial-business.

80. "Introducing Radio Spectrum," GSMA, February 2017, pp. 13-14, https://www.gsma.com/spectrum/wp-content/uploads/2017/04/Introducing-Radio-Spectrum.pdf.

81. "MRFAC Services – Effective October 1, 2012," MRFAC, Inc., http://www.mrfac.com/ServiceFees.shtm.

82. "Public Notice: Public Safety and Homeland Security Bureau and Wireless Telecommunications Bureau Announce the Completion of 800 MHz Band Reconfiguration in Certain NPSPAC Regions and the Availability of Additional Sprint Vacated Channels," FCC WT Docket 02-55, DA 14-1904, December 30, 2014, http://www.800ta.org/content/fccguidance/DA_14-1904_12.30.14.pdf.

83. "Public Notice: Public Safety and Homeland Security Bureau and Wireless Telecommunications Bureau Announce the Completion of 800 MHz Band Reconfiguration in Certain NPSPAC Regions," FCC WT Docket 02-55, DA 12-1838, November 27, 2012, http://www.800ta.org/content/fccguidance/DA_12-1838_11.27.12.pdf.

84. "Report to Congress on Spectrum Auctions (FCC 97-353)," FCC Wireless Telecommunications Bureau, October 9, 1997, https://www.fcc.gov/sites/default/files/wireless/auctions/data/papersAndStudies/fc970353.pd.

85. "Schedule of Services," Enterprise Wireless Alliance, https://www.enterprisewireless.org/resources/schedule_services.

86. "Simplex transmission," Computer Hope, https://www.computerhope.com/jargon/s/simptran.htm#:~:text=Examples%20of%20simplex%20include%20radio,one%20direction%2C%20at%20one%20time..

87. "Spectrum Management: Auctions," Every CRS Report, June 29, 2004, https://www.everycrsreport.com/reports/RL31764.html.

88. "Spectrum Management: FCC's Use and Enforcement of Buildout Requirements," Government Accountability Office, Report to Congressional Requesters, February 2014.

89. "Sprint details plans to shut down iDEN cell sites," Fierce Wireless, February 7, 2012, http://www.fiercewireless.com/story/sprint-details-plans-shut-down-iden-cell-sites/2012-02-07.

90. "The Electromagnetic Spectrum," NASA, March 2013, https://imagine.gsfc.nasa.gov/science/toolbox/emspectrum1.html#:~:text=Radio%20waves%2C%20gamma%2Drays%2C,at%20the%20speed%20of%20light.

91. "The Nextel Brand History," Nextel, https://www.nextelmobileworldwide.com/nextel-history/.

92. "The Technical Basis for Spectrum Rights: Policies to Enhance Market Efficiency," The Brookings Institution, March 3, 2011, https://www.brookings.edu/wp-content/uploads/2016/06/0303_spectrum_rights_matheson_morris.pdf.

93. "United States Frequency Allocations," NTIA, October 2003, https://www.ntia.doc.gov/files/ntia/publications/2003-allochrt.pdf.

94. "Use of Shared Spectrum at the National Level," The World Bank, June 10, 2020, https://digitalregulation.org/use-of-shared-spectrum-at-the-national-level/.

95. "What is Spectrum? A Brief Explainer," CTIA, June 5, 2018, https://www.ctia.org/news/what-is-spectrum-a-brief-explainer

96. "What is Spectrum? A Brief Explainer," CTIA, June 5, 2018, https://www.ctia.org/news/what-is-spectrum-a-brief-explainer.

97. "Wireless Telecommunications Bureau Fee Filing Guide," FCC.

98. "Wireless Telecommunications Investment Scams," FindLaw, March 26, 2008, https://corporate.findlaw.com/law-library/wireless-telecommunications-investment-scams.html.

99. 47 CFR Part 90 - PRIVATE LAND MOBILE RADIO SERVICESClifford M. Harrington and Tony Lin, "Unlicensed But Not Unregulated: An Overview of the FCC's Regulations Regarding Part 15 Devices," Pillsbury Advisory, June 2008.

100. Coleman Bazelon and Giulia McHenry, "Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy" (May 2015), https://api.ctia.org/docs/default-source/default-document-library/brattle_spectrum_051115.pdf.

101. Comments of Sprint Nextel Corporation, WT Docket No. 12-64, April 13, 2012.

102. Daniel R. Goodman, Solely in his Capacity as Receiver, Chadmoore Wireless Group, Inc., and SMR Services, Inc., et al., v. Federal Communications Commission and United States of America, Court of Appeals No. 95-1585, July 16, 1999.

103. FCC, "Construction/Coverage Requirements," http://wireless.fcc.gov/licensing/index.htm?job=const_req_by_service.

104. FCC, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order (FCC 04-168), WT Docket 02-55, adopted July 8, 2004, https://www.fcc.gov/release-fcc-04-168.

105. Securities and Exchange Commission v. Janus Spectrum LLC et al. Case No. 2:15-CV-00609-SMM.

106. Sprint Corporation, Form 10-K for the Fiscal year ended March 31, 2015, https://www.sec.gov/Archives/edgar/data/0000101830/000010183015000012/sprintcorp201410-k.htm.

107. U.S. Census Bureau, "Resident Population and Apportionment of the U.S. House of Representatives: Census 2000," United States, District of Columbia, and Puerto Rico Tables, https://www.census.gov/library/visualizations/2000/dec/2000-resident-population.html.

108. United States Securities and Exchange Commission, 1995 Annual Report, pp. 5-7, https://www.sec.gov/about/annual_report/1995.pdf.

109. United States v. Motorola, Inc. and Nextel Communications, Inc., Public Comments and Response on Proposed Final Judgment, Federal Register Volume 60, April 17, 1995, https://www.gpo.gov/fdsys/pkg/FR-1995-04-17/html/95-8814.htm.